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Chemistry
IN NEW ZEALAND

PETROLEUM AND OIL FOCUS

CHEMISTRY IN NEW ZEALAND

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FRONT COVER

Advantage Data Systems announce the A&D Digital Moisture Balance Range. Models are available to suit all types of laboratories and provide fast accurate moisture determinations on all types of samples. A&D Balances are available from Advantage Data Systems' network of branches and authorised dealers throughout New Zealand.

For further information see the **cover story on page 2.**

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NEXT ISSUE

Plastics, Resins & Paints Industry Focus
plus NZIC Conference Programme Issue

contributions and enquiries to:
The Editor,
Chemistry In New Zealand,
P.O. Box 33-1520,
Takapuna.
Phone 09 486 4304 Fax 09 486 4305

COVER STORY

THE A & D DIGITAL MOISTURE BALANCE RANGE

Advantage Data Systems offer a comprehensive range of digital moisture balances, ranging from the simple to use, economical AD4714 to the high weight resolution, multifunction AD4713.

The AD4714 moisture balance offers fast and easy moisture determination with a resolution of 0.01%. A sharp LCD display shows temperature, time and weight, or moisture content. Heating times of up to 99 minutes can be set through the touch pad keyboard and setting the temperature is made easy with the smooth rotary temperature dial.

The AD4714 uses a high efficiency infrared heating lamp to minimise measurement error caused by uneven heating or burning of the sample. A large 95 mm diameter pan allows the sample to be spread for faster heating. There is no need to measure sample weight, as the AD4714 will accept any sample sizes between 5 and 70g.

Offering additional features over the AD4714 for relatively little extra cost is the A&D Model AD4712. This moisture balance utilises a powerful, long life, sheathed ceramic heater to virtually eliminate measure errors. Any temperature between 50°C and 450°C and any time period, or continuous drying can be set by the user.

Measurement data can be printed with the optional printer or sent to a computer during measurement when the optional RS-232C interface is fitted. A non-volatile memory preserves temperature and time settings even after the unit is turned off. This feature is particularly useful when the AD4712 is used to determine the moisture of the same product type on a regular basis.

The recently released AD4713 moisture balance completes the range of A&D moisture balances. This model offers fast and easy moisture determination and has a weighing resolution of 0.001g. Utilising a high efficiency infrared heating lamp and a predict measurement function, the AD4713 minimises the measurement time required. The predict measurement function allows an operator to enter prediction coefficient calculations for up to seven samples and recall them when needed - the balance then predicts the moisture contents based on five minutes of drying.

A standard wireless remote keyboard commands all balance functions, making operation of the AD4713 straightforward and easy. An alarm signalling the finish of a drying period allows the operator to perform other tasks whilst the AD4713 also features a very high capacity for a moisture balance with samples of up to 300g being accepted.

Contact: Advantage Data Systems, P O Box 68 281, AUCKLAND, Ph. (09) 360 0916 Fax. (09) 360 0074
Or circle number 20 on the reader reply card

INDUSTRY NEWS

Universities Buy Enzymes Business

Auckland UniServices Limited and Waikato University have jointly purchased the interests in thermophilic enzyme research and development previously owned by Shell New Zealand Limited.

The Shell subsidiary, Pacific Enzymes Limited, was the commercial vehicle for research carried out at Waikato and Auckland Universities. Their research groups have had an international reputation in the field since 1982.

Thermophilic enzymes are found in thermal pools and are active at temperatures above 65°C. They show promise in treating hot wastes from a variety of industries. There is now increasing interest in their use as replacements for chlorine and peroxide in pulp and paper processing in New Zealand and overseas. The enzymes produced in New Zealand are already sold in small quantities for medical diagnostic use in the United States.

The new company, to be based in Auckland, will retain the Pacific Enzymes name. It intends to obtain more research contracts from overseas interests, and to seek licensees for its technology. Professor Roy Daniel of Waikato University says, "The independent nature of the new company will make it easier to do business with other companies in New Zealand and especially major biotechnology companies overseas. We are looking forward to an exciting future".

The Chief Executive of UniServices, Dr John Kernohan, commenting on the transaction said, "We have always enjoyed a co-operative relationship with Shell in the enzyme business. They have been very helpful in structuring the sale and purchase arrangements to suit us".
For further information contact:

Uniservices		
	Dr. John Kernohan	(09) 373 7522 (Bus.)
		(09) 528 4776 (Res.)
	Mark Burgess	(09) 373 7522 (Bus.)
		(09) 625 9097 (Res.)
Shell		
	Brian Wesney	(04) 472 0080 (Bus.)

Douglas Scientific Increase Their Presence In The South Island

Douglas Scientific are pleased to announce the appointment of Bob Foulkes to our Christchurch office to enhance the level of service and support we can provide both to Christchurch and to our other South Island clients.

Bob has previously worked in a variety of scientific research institutions, in the analytical instrument business and in the computer field. Bob brings to Douglas a breadth of experience in chromatography and instrumental methods of analysis and this combined with a strong service ethic will we trust make him a valuable client resource.

Contact: Douglas Scientific, P.O. Box 32-116, Linwood, Christchurch. Ph. (03) 381 2333 Fax (03) 381 2533 Mobile (025) 904046.

Chemiplas Appointed Taranaki Distributor

Chemiplas NZ Limited is pleased to announce that it has been appointed sole distributor in New Zealand for Tanaka Scientific Instrument Co. Ltd, Japan. Tanaka Scientific manufacture a complete range of automatic Petroleum Testers including Distillation, Crude Distillation, Narrow Boiling Point Distillation, Flash Point, Kinematic Viscosity, Viscometer Cleaner, X-ray Sulphur, Auto Combustion, Vapour Pressure, Pour/Cloud Point, Carbon Residue, Aniline Point, Softening Point, Moisture and Density/Specific Gravity.
For further information, please contact: Mike Good, Chemiplas NZ Limited, Ph. (09) 379 3466.

"Chemical Processes in New Zealand Project"

Individual School-Chemical Organisation Links
In 1991 I wrote to about 400 chemical organisations, laboratories or businesses and asked if they would be willing to be linked to an individual school to help students and teachers learn more about the role of chemistry and business in society. I also wrote to all secondary schools in New Zealand and asked if they would like to be linked to an organisation to facilitate learning more about chemistry and chemistry's role in society. The scheme had the support of the Ministry of Science. Approximately 130 organisations replied in the affirmative giving me names of their contact people. I offered schools a free copy of Volume Two of "Chemical Processes in New Zealand" if they participated. Fortunately the number of schools wishing to join was also about 130. In 1991 I sent these schools the name and address of the organisations to which I had linked them and the name of the person to contact, and informed the organisations of the school to which they were linked and the name of the teacher. My instructions were for the teachers to make the contact. I said I hoped that from these links information and articles useful for producing a new edition of "Chemical Processes in New Zealand" might result. In February 1992 I left for York, UK, on sabbatical leave and "left them to it".
On my return in February of this year we decided to send all schools in NZ a free copy of Volume Two. (It was not selling well and it seemed an appropriate contribution from the NZIC to chemical education). In May this year I wrote to all the participating schools and asked for a brief report on how the scheme had progressed. No doubt I would have been very disappointed in the results if I had not spent the year with my desk in the Science Education Centre at the University of York, a truly magnificent organisation. One section of this is the UK Chemical Industries Education Centre. From its Director I learned that both schools and industry need much assistance and advice for links between them to be profitable. Most teachers and professional chemists know so little about each other that they do not really know how to proceed. This certainly proved true here. Below is a rough summary of the replies.

Number of replies: 60

Six said they had not received information on to whom they were linked. Eighteen had not attempted to make contact. Some gave reasons, a common one being the fact that the original teacher had left. One reason - teacher got pregnant. Three attempted to make contact but failed. Thirty one schools successfully made contact. Four found the activities of the organisation were not suitable. Three said that the organisation failed to come back to them after the contact had been made. Thirteen schools did have successful interaction of some sort. In four cases the links led to individual students having work experience with the organisation. One school sent me two reports on the organisation written by individual students, and they were very impressive. One school linked to a large organisation reported:

1. Form 5 involved in a day tour of the works.
2. Form 6 involved in lab tour of their three laboratories.
3. Form 7 involved in days work experience.
4. The Company has visited our school to discuss further links in maths, economics and social studies.

I would like to thank all the organisations which offered to take part in this scheme and to which I linked a school and to apologise to those professional chemists who waited in vain for their school to make contact. I hope that some further contacts might still be made. Although the project has been far less successful that I had hoped, I believe it has shown there is indeed scope for chemical organisations and professional chemists to make considerable contributions to individual schools on a one to one basis. But it is clear that both schools and professional organisations need much advice and help in developing fruitful links. Thus I am pleased to be able to report that the British Council has made a grant that has allowed me to arrange for Miranda Mapletoft, the Manager of the Chemical Industries Education Centre at York, to visit NZ for a two week period at the beginning of December. She will be the leading speaker at the one day Chemical Education Symposium on Thursday, 9th December at the NZIC Conference in Auckland. The Symposium will consider the role professional chemists and organisations can play in education, especially in light of the new curriculum, and the implications of the new technology curriculum for chemistry teachers. As convener of the symposium, I hope that professional chemists who believe they or their organisation can make contributions to Chemical Education will attend and make a contribution to the discussions. While in NZ, Miranda will have time to visit a number of centres. I am arranging for her to visit Hamilton, Wellington where she will visit the Royal Society and the Executive Director of the NZ Chemicals Industry Council, and the South Island. Anyone or organisation who would like to meet Miranda and have discussions with her should contact me.

J. E. Packer
Editor - "Chemical Processes in New Zealand",
University of Auckland
Private Bag 92019
AUCKLAND
Ph. (09) 373 7599,
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News From Across the Ditch

RACI MEDALS 1993

The 1993 H.G. Smith Medal was awarded to Professor David Black (FRACI) of the University of NSW in recognition of his international reputation in the field of nitrogen heterocycles. Dr. Black held a visiting professorship at the University of Auckland, Chemistry Department during 1992.

The 1993 Leighton Memorial Medal was awarded to Dr. Joe Baker OBE (FRACI) for outstanding contributions to the development of chemistry through his research work on marine natural product chemistry and as Director of the Roche Institute of Marine Pharmacology, as Director of the Sir George Fisher Centre for Tropical Marine Studies and as Director of the Australian Institute of Marine Science.
The 1993 Applied Research Medal was awarded jointly to Professor R. Alexander (FRACI) and Associate Professor R.A. Kagi (FRACI) of Curtin University who working closely together for many years have made a major contribution to the development of new concepts in petroleum geochemistry.

The 1993 Rennie Medal was awarded equally to Dr. Margaret Harding (MRACI) of the University of Sydney and Dr. Carl Schiesser (MRACI) of the University of Melbourne.

NO MORE "FREE-BEES"

The RACI Council recently announced that non financial members will be sent only three issues (instead of the current six) after their subscriptions become due. RACI members' subscriptions were due on 1 July, 1993, and the September issue of Chemistry in Australia will be the last sent to non financial corporate members. Subscription enquiries should be directed to: RACI National Secretariat, Ph. 61-3-3282033.

WAR-TIME HISTORY PUBLISHED

Prof. Ian D. Rae (our Australian correspondent) and Lester Stonyer have had their article *"New Zealand Chemists in Australia's Munitions Industry in the Second World War"* published in Historical Records of Australian Science Vol. 9 No. 3 (June 93). Those chemists who returned to New Zealand, and who provided their stories, are:

In Auckland:	W. Bishop*	J. Carroll
	G. Dingley	H. Oakley
	J. Ricketts*	M. Sinclair,
	G. Walter*	
In Hamilton:	F. Thompson.	
In Wellington:	P. Coates	E. Hay*
	A. Lees	E. Sellens,
	L. Stonyer	
In Nelson:	W. Bythell.	
In Christchurch:	A. Adams	R. Elder
	R. Hutchinson.	
In Dunedin:	W. Broughton	

* indicates that the chemist's widow provided the information.

Of the eight who are known to have remained in Australia, only L. Bird, G. Jones, and N. Stace are still alive.

J. Arkinstall, R. Collin, W. Davis, M. Jermyn and W. Ridland were all traced through their widows. There were three who seem to have taken occupations that made them untraceable, although we know that J. Martin has died. Where are W. Chappell and F. Saxton? The Journal is available in the University of Auckland Library.

P.S. N.Z. must be a healthy place to live - only 4 out of 18 have died!

Lester Stonyer

INTERNATIONAL NEWS

INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY (IUPAC) NEWS

Discovery of Transfermium Elements

An IUPAC-IUPAP Working Group was appointed in 1987 to consider the above issue. Its Phase (i) report, entitled *Criteria that must be satisfied for the discovery of a new chemical element to be recognized,* was published in the journal *Pure and Applied Chemistry (PAC)* during 1991 (Vol. 63, No. 6, pp. 879-886). The Phase (ii) report covered *Introduction to discovery profiles and discovery profiles of the transfermium elements,* and was due to appear in the August 1993 issue of *PAC* together with responses from the laboratories at Berkeley, Dubna, and Darmstadt, and a final response from the Working Group to these criticisms. The Phase (ii) report was also published (without the responses) in *Prog. Part. Nucl. Phys.* Vol. 29, pp. 453-530, (1992).

The Working Group has now ceased officially to exist and, as far as IUPAC is concerned, it is now up to the IUPAC Commission on Nomenclature of Inorganic Chemistry to recommend actual names for the elements. This Commission was due to meet next at the IUPAC General Assembly in Lisbon, Portugal, August 1993. Further details from:

Dr. Michael Freemantle,
Information Officer,
Bank Court Chambers,
2-3 Pound Way, Templars Square,
Cowley, Oxford OX4 3YF,
UNITED KINGDOM.
Ph. 44 (865) 747744
Fax 44 (865) 747510.

LETTER TO THE EDITOR

10 Manly Gardens
Paraparaumu.
30.8.93

Editor/Editorial Committee,
(Sorry Board) J.N.Z.I.C.

Gentlemen,

I must congratulate you on the "new" journal. The layout is better, the typeface is better, the whole journal seems more interesting and more readable: Please keep up the good work!
A small item you might like to include some time is enclosed. *(See War Time History Published - left)*

Sincerely,

C.L.H. Stonyer

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For further information circle number 8 on the reader reply card

ZEOLITE CATALYSIS
FOR THE FUELS OF TODAY AND TOMORROW

by Ian Maxwell, Carol Williams, Fred Muller and Ben Krutzen
Shell International Chemical Company Limited

INTRODUCTION

Increasing environmental awareness and the introduction of stringent government legislation are having a major impact on many businesses, including oil refining. This affects not only the processes within the refinery itself, but also the transportation fuels the refinery produces.

Environmental legislation on phasing out alkyl-lead octane-boosting additives from gasoline was begun in the 1970s. Lead removal from gasoline was a prerequisite for the introduction of vehicle exhaust catalysts, used to reduce environmentally hazardous emissions from gasoline powered cars.

Diesel fuel is also an important transportation fuel. In this case, reduced particulate will probably be met primarily through changes in engine technology and new exhaust catalyst systems, but improvements in the quality of diesel fuels will also have a role.

To meet increased product quality demands individual refinery processes (Figure 1) have come under scrutiny. Catalytic processes form a significant part of the technological response to the resultant new transportation fuel demands in the market place. This paper seeks to highlight the role of zeolites in oil refining processes, the manner in which research can improve their performance, and how technological advances lead to new generations of zeolite catalysts.

GASOLINE AND DIESEL FUEL CHARACTERISTICS

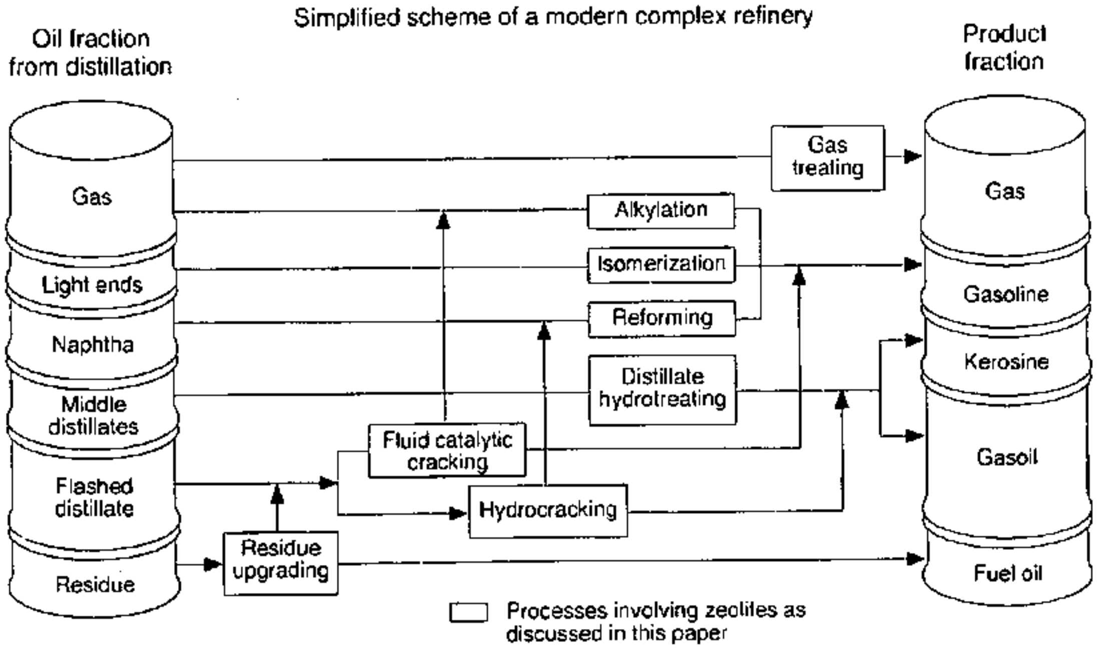
Gasoline Fuel Characteristics

Gasoline must have a certain octane quality to prevent the engine from 'knocking'. This phenomenon is caused by the auto-ignition of the air-fuel mixtures in a cylinder during combustion ahead of the advancing flame. It hinders smooth driving and may damage the engine. The higher the compression ratio of the engine, the higher the octane quality required. The octane quality is indicated by the octane number (ON). There are two methods of determining the ON based on a single-cylinder laboratory test engine. One gives the Research Octane Number (RON); the other, the Motor Octane Number (MON). Both are important to prevent knock under real driving conditions. Aromatics, highly branched iso-paraffins and oxygen-containing components have a high octane quality, whereas the octane quality of normal paraffins is low.

Figure 1

The crude oil refinery

Simplified scheme of a modern complex refinery



The conversion of crude oil into transportation fuels starts with its distillation into various fractions. Naphtha and light ends are converted into gasoline using various catalytic processes. Middle distillates, kerosine and diesel, are hydrotreated in order to meet product specifications. Hydrocracking and catalytic cracking convert the heavy (vacuum) distillate and residue conversion products into gases, gasoline and middle distillates.

SCIENTIFIC INSTRUMENTATION FOR THE
PETROCHEMICAL INDUSTRY

REVIEW

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Monitoring
Process Control

Quality Control
Analysis

Environmental
Analysis

New High Speed GAS CHROMATOGRAPHY SYSTEMS
MTI Microsensor Technology (Inc) USA

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The (MTI Inc) Micro Sensor Technology units can be single channel or can be configured as a 4 channel system for laboratory or field usage for fast analysis of complex samples.

Demonstrations can be arranged for your application.

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NIR On-Line or Lab Based Systems

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Demonstrations can be arranged for your applications.

ROSEMOUNT-DOHRMANN Continued ...

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In the late 1970s Dorhmann adapted the methodology for water analysis. Today granulated activated carbon (GAC) extraction remains the method of choice for the preconcentration from water of organic halides at ultra-trace levels.

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Sample Preparation
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ION CHROMATOGRAPHY
Dionex USA

Dionex have just released a new Ion Chromatography System which offers the highest performance ever available for IC analysis.

The new system, DX-500, features high speed module to PC communications providing a unified system environment for real-time monitoring.

A selection of DX-500 conductivity electrochemical and other optional detectors when used with the Dionex autosuppression and self regenerating suppressor conductivity detection is 100 times more sensitive than any other ion analysis technique.

If you are processing large numbers of samples for chromatographic analysis then the Dionex could be the solution you have been waiting for. These systems are now being used in New Zealand.

Applications exist in the environmental areas, polymer industries, petroleum industry and natural product separations. Further applications are being developed for high moisture content matrices, pharmaceutical industries, food markets and in the clinical laboratory.

SFE DIONEX SAMPLE PREPARATION

Supercritical Fluid Extraction (SFE) is a relatively new technique in the field of analytical chemistry. It has evolved in the last decade as an alternative method of preparing samples prior to analysis. SFE offers the analyst many advantages that are not available in more conventional sample preparation techniques such as distillation, extraction with organic solvents or low resolution chromatography.

What is a Supercritical Fluid?

A supercritical fluid is a gas which is heated beyond the temperature at which it can be turned into a liquid by compression.

Supercritical fluids have some very useful properties. The first of these is their high solubilizing power. This creates the possibility of using one extraction fluid to extract a host of analytes or varying polarities and molecular sizes. In addition, the solute/fluid binary diffusion coefficient are larger in supercritical fluid systems than in liquid extraction systems which makes the extraction process faster.

Supercritical Carbon Dioxide

Most supercritical fluid extraction systems use carbon dioxide. The low critical temperature of CO_2 makes it ideal for the extraction of thermally labile compounds under conditions slightly above room temperature.

Supercritical Fluid Extraction

The Dionex SFE-703 Critical Fluid Extractor meets your extraction requirements with the following features:

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IOC ... not DOC

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Applications

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FURTHER INFORMATION

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Keywords

ATA - SCIENTIFIC - ON LINE - TITRATOR

Issue 4, 1993

ON LINE ANALYSIS - PROCESS & EFFLUENT CONTROL

TITRATORS, COLORIMETERS, UV AND ELEMENTAL ANALYSIS

THIS ISSUE

- Programmable Titrator
- Programmable Colorimeter
- Process Spectrophotometers
- On stream Elemental Analyser
- Seminar Water Analysis

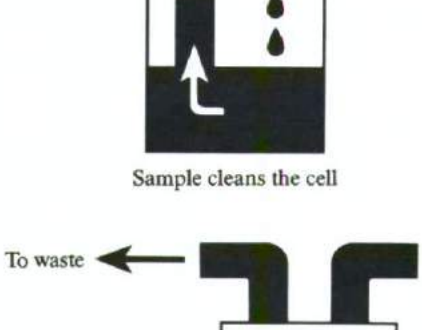
PROGRAMMABLE TITRATOR

The instrument is an elegantly simple liquids handling & measurement system. This results in a very reliable general-purpose titrator. The system reliably captures a fresh sample, conditions it and titrates to fixed endpoint. The on-board computer operates the components, takes readings from the sensor, and calculates and transmits sample concentration over any of a variety of outputs. Sample capture is similar to use of an over-flow cup, except that *siphon action* drains the sample to a final repeatable level (volume).

A person with little chemistry background can use the instrument with minimal training. Step-by-step instructions are displayed to guide the operator through each procedure.

The user must only know the analytical method and range of sample concentration. The analyser automatically determines all other analytical parameters such as titrant volume and titration end point.

Sample cleans the cell



Flow is stopped, sample is captured

PATENTED FLOW - THROUGH REACTION CELL

The reaction cell is used both to capture and to analyse the sample. The cell contains no moving parts and is avaliable in a variety of materials (PTFE is standard).

Calibration is automatically performed at programmed intervals to adjust for system changes such as cell volume, electrode drift and reagent concentration.

Normal operation is fully automated, with user selected analysis frequency and calibration interval. Remote monitoring and control are possible through the bidirectional RS-232C port. Outputs are industry standard, such as 4-20mA current loop. Dual-level alarms are set and enabled by the user.

Diagnostics can be accessed with the diagnostic key to verify operation of selected components and to review results such as the last 24 analyses or the last 6 calibrations. The single-key-accessible set-up menu can be used to review and reset all operating and analytical parameters.

Fluidic and electronic hardware are designed in modules for rapid and simple servicing. Each fluidic component is mounted on a panel for simple removal and replacement.

TYPICAL TITRATION APPLICATIONS

ALKALINITY
HARDNESS - REDOX
COPPER - IRON
PICKLING SOLUTIONS
CAUSTIC - PEROXIDE
ACIDS - SULPHIDE
ABC IN PULP
CYANIDE - CHLORIDE

PROGRAMMABLE COLORIMETER

PROGRAMMABLE COLORIMETER

The FPA 800 uses a batch sampling technique and a dipping colorimetric probe which eliminates the use of and the problems associated with smallbore tubing found in continuous flow systems. Analyses are only performed as frequently as required, thus minimizing reagent consumption.

A single beam, dual wavelength optical configuration and an automatic background correction prevents sample colour and turbidity from interfering with the analysis results. Automatic calibration ensures instrument accuracy.

The modular design of both the fluidic and the electronic sections allows for rapid and simple servicing. Each fluidic component is mounted on a panel for ease of removal and replacement.

THEORY OF OPERATION

A reaction cell is used both to capture and to analyse the sample. A dipping colorimetric probe is mounted in the reaction cell to measure the absorbance of the resulting solution. The reaction cell contains no moving parts and is constructed of Teflon for excellent chemical resistance characteristics. All sample and reagent lines are 1/4″. Mixing is accomplished through the use of a magnetic Teflon coated stir bar. Fibreoptics are used to transmit light to and from the reaction cell. The light source is a tungsten filament which provides a continuum between 400 & 900 nm. The fibreoptics bundle of the return path is bifurcated to facilitate the dual wavelength operation.

DESIGN FEATURES

Batch sampling allows for:

Large bore tubing

No mixing coils

Low reagent consumption

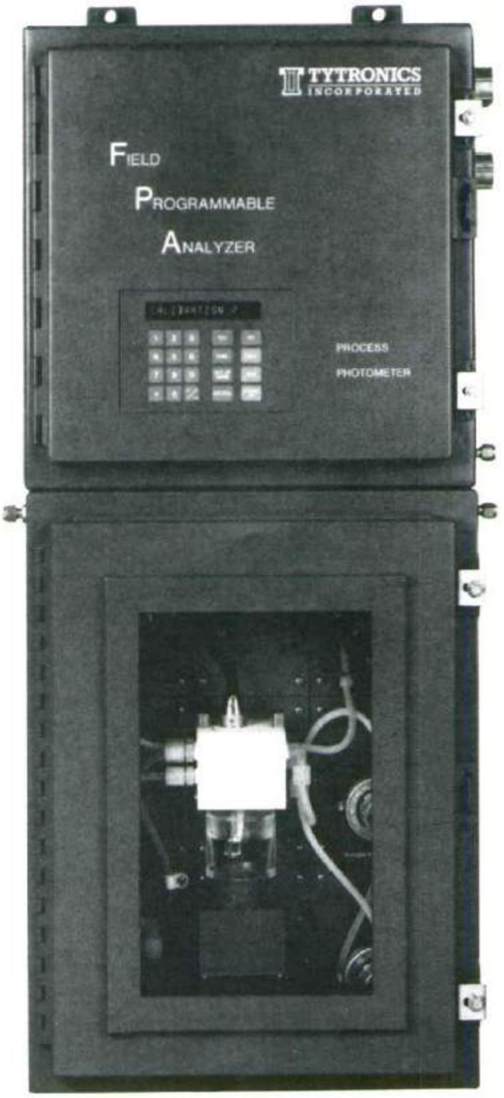
Analysis of both high & low concentrations

Optics designed with background correction:-

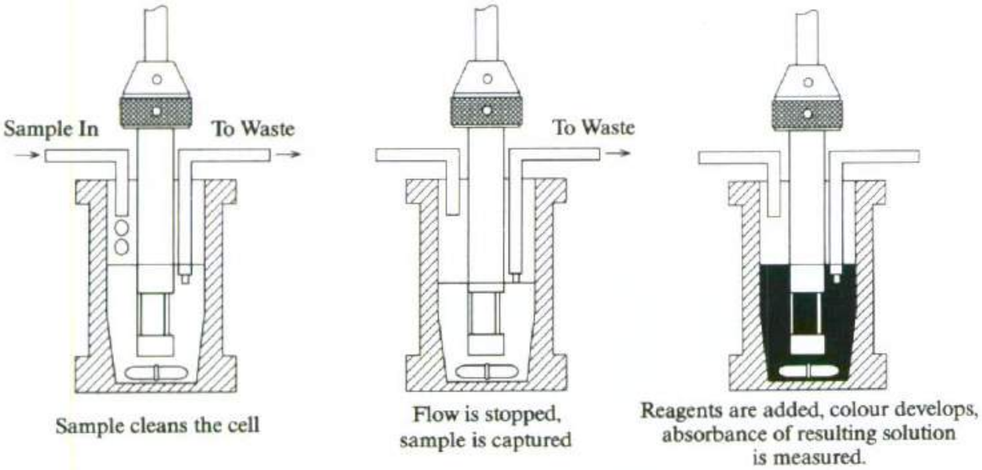
No interference from sample colour & turbidity

No effects of lamp aging

No effects of optics coating



PATENTED SAMPLE CAPTURE/REACTION CELL



Sample cleans the cell

Flow is stopped, sample is captured

Reagents are added, colour develops, absorbance of resulting solution is measured.

TYPICAL APPLICATIONS

ALUMINIUM

AMMONIA

HARDNESS

CHROMIUM - CHLORIDE

IRON - COPPER

NICKEL - ZINC

PHOSPHATE

PROCESS SPECTROPHOTOMETERS

PROCESS SPECTROPHOTOMETERS

Single and dual spectrophotometric analysers have been designed to provide continuous on-line analysis of process streams, ensure maximum reliability and minimum operator attention.

Spectrophotometry offers on-line analytical capability at trace levels in applications such as monitoring plant effluent and municipal water, and environment analysis in general.

A light source in the visible, ultravoilet or very-near-infrared region is passed through the sample, then through an optical filter and the absorbance of the returning energy is measured at the selected wavelength. The concentration of the solution is proportional to the absorbance measured.

The instruments use fibre optics to remotely sense in a pipeline cell. Depending on the sample pipe diameter, the non-intrusive measurement is made with a cell installed directly into the line. Alternatively, a by-pass line of selected pipe diameter can be installed to select the diameter for a more appropriate pathlength. This simplicity along with judicious use of state-of-the-art fibre-optics and a proven electronics packaging design, results in a very reliable analytical tool for the user. Conventional liquid and gas cells are also available.

DESIGN FEATURES

Fiber-Optic light path which:

Eliminates lens

Allows for remote sensing

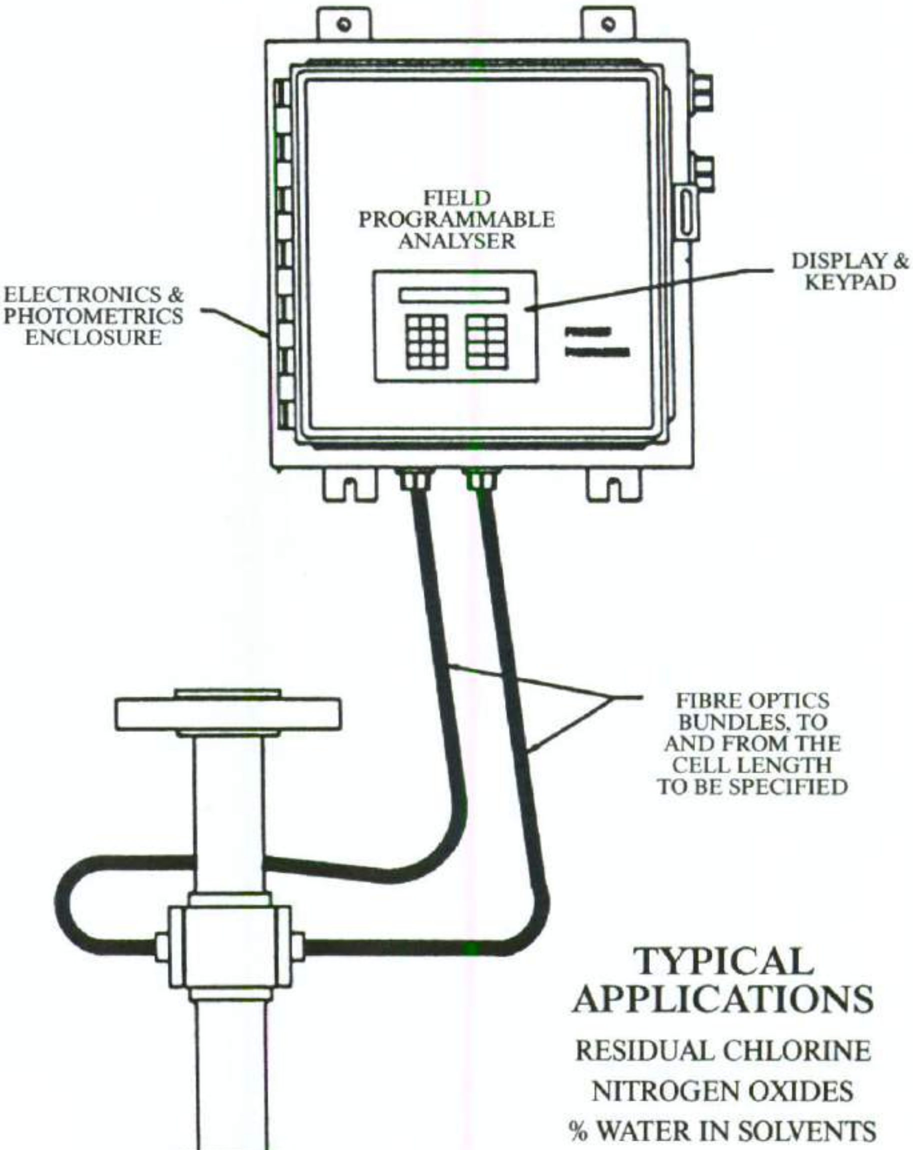
Is compact and more reliable

Sample-Line cell for:

Uninterrupted sampling

Rapid response

PROCESS UV ANALYSER WITH A PIPE-LINE CELL



TYPICAL APPLICATIONS

RESIDUAL CHLORINE

NITROGEN OXIDES

% WATER IN SOLVENTS

COPPER

CHLORINE DIOXIDE IN PULP

OIL IN WATER

DOWTHERM HEAT EXCHANGE FLUIDS

SULPHUR DIOXIDE

COLOUR OF SOLVENTS

☑ **FOR LITERATURE**
☐ TITRATOR
☐ COLORIMETER
☐ SPECTROPHOTOMETER
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ON - STREAM XRF ANALYSIS OF ANY ELEMENT FROM ALUMINIUM TO URANIUM

X-ray fluorescence is an established analytical technique used in many industrial laboratories. However, the XRF technique is also well suited for on-line applications.

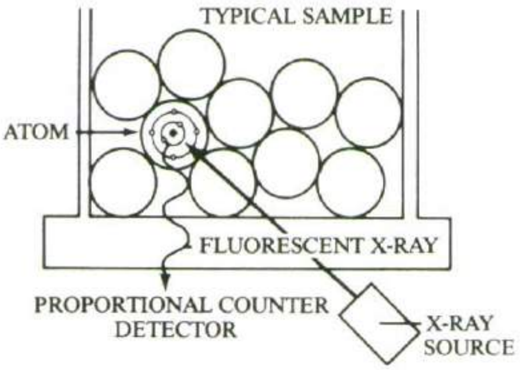
It is non-destructing, requires minimum (if any) sample preparation, and is applicable over a wide range of elements and concentrations.

On-line XRF is applicable anywhere there is a need for frequent elemental analysis for the purpose of controlling the process or maintaining high quality of the products.

On stream XRF can provide continuous monitoring of liquids in pipelines or tanks, granular solids in chutes, parts on conveyors, coatings on moving sheets of metal, or pigments in moving plastic or paper sheets.

PRINCIPLE OF ANALYSIS

X-Ray fluorescence provides specific analyses of total elemental concentrations, without regard to chemical combinations. The sample is irradiated with a low level radioisotope source. This radiation excites the elements in the sample, causing them to fluoresce i.e. give off their own characteristic x-rays which identifies the element and the intensity is a measure of the elements' concentration in the sample. The resulting signal is integrated over a time period to give an average measure of concentration during this time.



Sample excitation and fluorescent x-ray detection take place on the same side of the sample; it is not necessary to transmit energy through the sample stream. This makes it very convenient for many varied sampling modes.

Measurement of elements in thin films and the determination of coating thickness on metal or plastic substrates is facilitated by these attributes. As long as the sample is in contact with, or close to, the measuring head, it can be easily analysed. Note that it is not necessary for the sample to touch the measuring head.

DATA PROCESSING

The raw x-ray data from the detector is corrected for background and interfering element radiation in the sample. The resulting net x-ray intensity is then used to calculate the concentration. Results can be expressed in any desired unit of concentration (e.g. ppm, %, etc.).

TYPICAL APPLICATIONS

PLATING SOLUTIONS
COATING THICKNESS
SULPHUR IN OIL
ASH IN COAL
SILICA ON PAPER
PHOSPHATE COATINGS
CALCIUM IN FOOD

4

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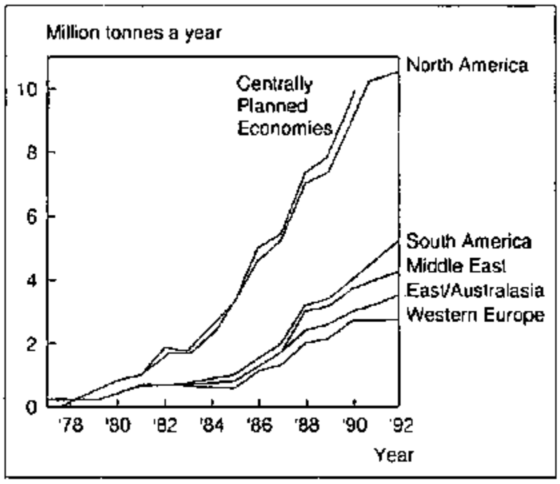
Table 1

Some gasoline components

Component	RON	MON
Methyl tert-butyl ether	118	100
Ethyl tert-butyl ether	118	102
tert-Amyl methyl ether	111	98
i-C_5/C_6	75 – 102	75 – 102
Alkylate	92 – 97	90 – 94

Figure 2

MTBE capacity by region



Typical RONs for unleaded gasolines are 95 for Euro-grade (Regular) and 98 for super-grade.

A number of other characteristics, notably volatility and the distillation curve, also have to be within certain limits in order to ensure satisfactory performance.

Diesel Fuel Characteristics

The ignition performance of diesel fuel is indicated by the cetane number (CN). In a diesel engine, the fuel is injected into a combustion chamber already filled with hot, compressed air, and ignites spontaneously (no spark). In contrast to gasoline, therefore, diesel should have a high auto-ignition tendency. The CN is a measure of this tendency, and its value for a given diesel fuel is again determined in a test engine. Normal paraffins have high CNs: aromatics, on the other hand, have low ones.
Although having a high CN, normal paraffins do tend to crystallise at low temperatures. The crystals may block the fuels filters and thus hinder the fuel supply. To avoid such problems, diesel fuels must comply with certain specifications with respect to cold flow properties.

Fuel Composition

Increasingly stringent environmental legislation and the demand for high product quality are together stimulating changes in the oil refining industry. Emphasis is shifting from processes that merely upgrade in terms of fuel performance to those producing high quality fuels with a lower environmental impact. While the largest reductions in emissions are achieved through hardware modifications such as exhaust catalysts and cleaner burning engines, changes in fuel composition contribute as well. Table 2 shows some of the expected trends in fuel composition in Europe. Refinery processes that incorporate zeolites as catalysts have made a profound impact in this area.

Table 2

Expected trends in transportation fuel composition

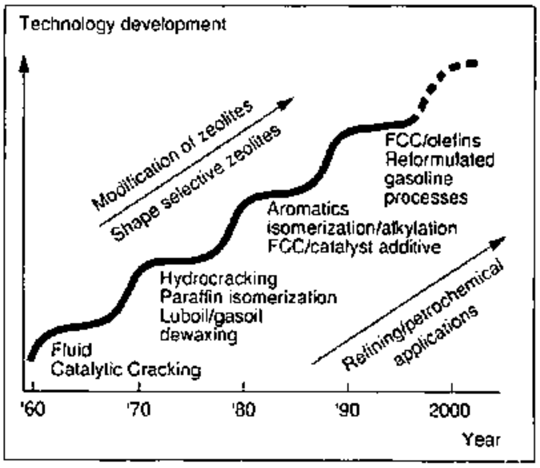
Fuel	Characteristic	Change	Comment
Gasoline	Lead content	↓	Will reduce lead emissions; prerequisite for use of exhaust catalysts
	Benzene content	↓	Will reduce toxic benzene emissions
	Sulfur content	↓	Will reduce sulfur inhibition of exhaust catalyst activity and the risk of H_2S emission
	Vapour pressure	↓	Will reduce evaporative hydrocarbon emissions
	Isoparaffins content	↑	Will increase octane quality
	Oxygenates content	↑	Will reduce exhaust emissions of CO and hydrocarbons but increase those of aldehydes (and nitrogen oxides)
Diesel	Sulfur content	↓	Will reduce exhaust particulate emissions
	Aromatics content	↓	Will increase cetane number and reduce gaseous and particulate emissions
	Volatility	↑	Will reduce exhaust emissions

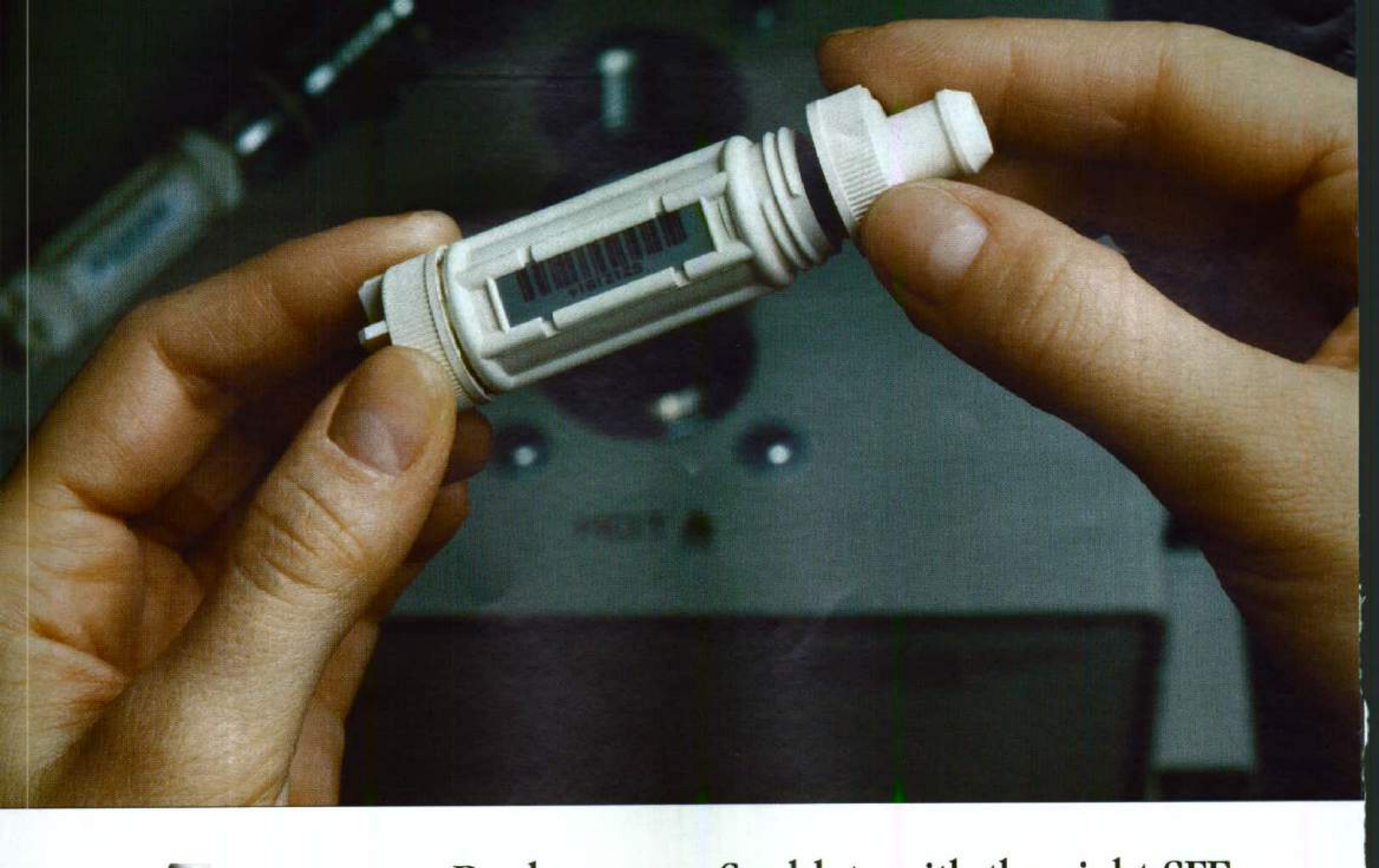
ZEOLITES

Zeolites have found extensive use as catalysts in oil refining over the last 20-30 years. The way in which this has evolved reflects the interplay between market needs, scientific discoveries and technological developments (Figure 3). Research into zeolite catalysis aims to improve existing processes and catalysts and develop new ones for the manufacture of high quality products.

Figure 3

Evolution in zeolite catalysis as applied to oil refining





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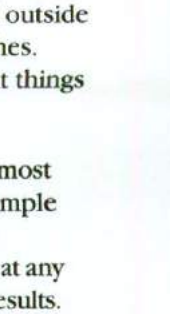

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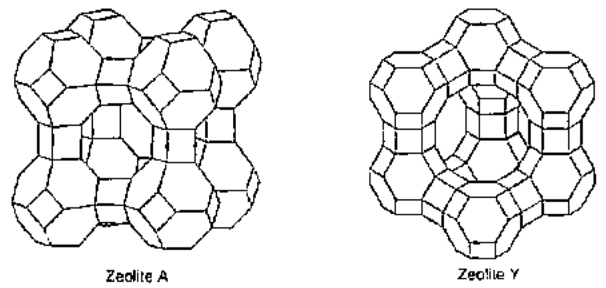
Zeolite Structures

Zeolites are found in small amounts as naturally occurring minerals, but a more extensive range of zeolite structures can be synthesised on a commercial scale. They are crystalline, microporous materials containing silicon (Si), aluminium (Al), and oxygen (O). Structurally, they are complex inorganic polymers built up from SiO_4 and AlO_4 tetrahedra.

These primary building units are joined together via shared oxygen ions in such a way as to create a wide range of different structures which contain uniform, interconnected cavities and channels of molecular dimensions. These channels normally make up about 50% of the zeolite crystal volume. Two examples of zeolite structures are shown in Figure 4.

Figure 4

Examples of zeolite structures



The lines represent Si-O-Si or Si-O-Al bonds

The presence of aluminium in the structure results in a net negative charge associated with each AlO_4 tetrahedron. This is compensated by the presence of charge-balancing cations (e.g. sodium cations) that are situated in the microporous channels and cavities. The silicon/aluminium ratio in zeolite structures is variable, ranging from values of one to several hundreds. A great variety of zeolite structures and chemical compositions can be synthesised.

Zeolite Catalysis

The following attributes make zeolites important catalysts:

well defined pore-size distribution;
high surface area;
Good thermal and hydrothermal stability;
high resistance to hetero-atom (sulfur, nitrogen) poisoning;
low coke forming tendency;
strong and adjustable acidity; and
molecular shape selective control of reactions.

The acidity provides the catalytic activity while the well defined micropores provide the shape selectivity.

ACIDITY

Zeolites behave as solid acid catalysts because they can have strongly acidic protons uniformly distributed throughout the internal volume of the channels and cavities. These protons are introduced by exchange with the other charge balancing cations normally present after synthesis. By changing the silicon/aluminium ratio of the zeolite it is possible to vary both the number and strength of the acid sites. This can be done either at the synthesis stage or in subsequent modification treatments. In this manner the acidity of the zeolite can be tailored to suit a wide range of specific catalytic applications.

SHAPE SELECTIVITY

Since zeolite channels and cavities are of molecular dimensions, zeolites are able to discriminate between molecules on the basis of molecular shapes and sizes. This gives rise to the shape selective properties of zeolite catalysts of which at least three types can be discerned:

- reactant shape selectivity whereby only feed molecules with dimensions smaller than those of the zeolite pores are able to reach the active acid sites and undergo reaction;
- transition state shape selectivity whereby during reaction, only such molecules can be formed whose transition state geometry is able to be accommodated within the zeolite pores; and
- product shape selectivity whereby only product molecules that are small enough are able to diffuse out of the pores.

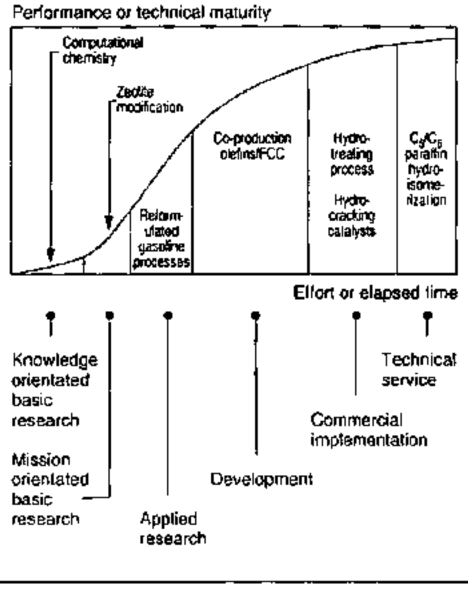
Thus, the appropriate selection of zeolite structure and pore dimensions enables the selectivity of a given catalysed reaction to be finely controlled.

Molecular size discrimination also gives rise to 'molecular sieving properties' whereby non-acidic zeolites, which in this case do not function as catalysts, are used for molecular separations. This method of molecular sieving is exploited in the Shell/Universal Oil Products Company (UOP) Total Isomerization Process (TIP). The calcium-exchanged form of zeolite A (known as zeolite 5A) which is used in this process allows a linear paraffin to pass through the eight-membered ring pores into the internal cavity, while a branched paraffin is too bulky and is excluded.

As with most technological advances there are progressive phases of research and development (Figure 6).

Figure 6

**Zeolite catalysis in Shell:
Basic research to commercialization**



Examples of zeolite applications in refining processes are in the production of:

- higher octane and more environmentally acceptable gasoline components (Hysomer/TIP process);
- better quality middle distillate products - in particular diesel fuel (hydrocracking and deep hydrotreating processes); and
- lower olefins (primarily butenes) as feedstock for the manufacture of high octane gasoline components, such as MTBE and alkylate.

ZEOLITE APPLICATIONS

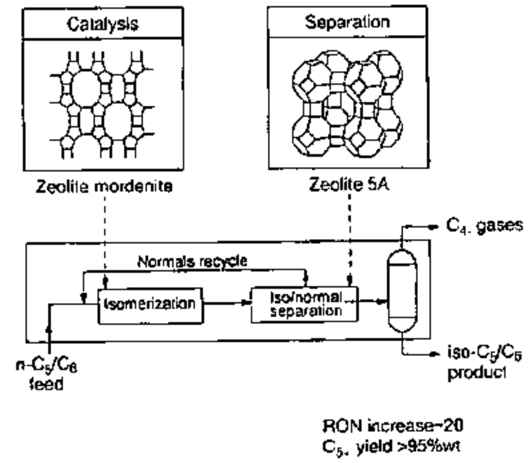
Hysomer/TIP Process

Isoparaffin molecules exhibit high octane quality and are therefore attractive gasoline components. In the 1960s, research was initiated in Shell laboratories to develop a process that would selectively hydroisomerize C_5 and C_6 paraffinic molecules (Hysomer) to isoparaffins. The octane number of a mixed C_5/C_6 n-paraffinic feedstock can be increased substantially using the zeolite-based Hysomer process. Zeolite catalysts, in particular those based on the acid form of mordenite incorporating a platinum metal function, were found to exhibit good activity and stability in paraffin hydroisomerization.

However, the skeletal isomerization reaction involved is equilibrium-limited. Thus, at the temperature used complete conversion of the normal paraffins is not possible. To overcome this thermodynamic limitation the catalytic hydroisomerization step is combined with a molecular separation process based on zeolite 5A. This zeolite was developed by Union Carbide Corporation specifically for the separation of normal and branched paraffins.

Figure 7

The Shell/UOP paraffin Total Isomerization Process (TIP)



The effluent from this Hysomer process is treated in the subsequent separation step, and the normal paraffins recycled back to the isomerization section. These steps ensure the almost complete conversion to isoparaffins. This is the basis of the Shell/UOP TIP process (Figure 7) and it results in significant increases in octane number compared to the single-step Hysomer process.

On the introduction of legislation in some countries in the late 1970s, requiring lead removal from gasoline, Hysomer and TIP process technology were widely adopted in oil refineries. The zeolite catalyst system has proved stable and is also resistant to low levels of feedstock impurities such as sulfur and water. Today, interest in paraffin isomerization technology continues as refiners seek processes that product attractive reformulated gasoline components.

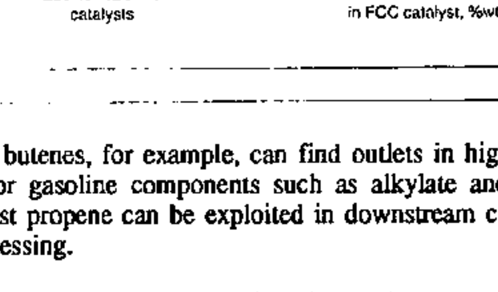
Olefins from Catalytic Cracking

The advent of reformulated gasoline has led to an increasing demand for lower olefins, in particular butenes and pentenes. These olefins are used as feedstock for the paraffin alkylation process and ether (e.g. MTBE) manufacture.

Research in a number of industrial laboratories has shown that the product distribution from fluid catalytic crackers employing large-pore zeolite-Y-based catalysts can be modified by the addition of a second catalyst - in the form of a medium pore zeolite such as ZSM-5. This process, now incorporating two zeolite catalysts, provides a significant increase in the yield of lower olefins (Figure 8).

Figure 8

Olefins co-production using a ZSM-5 zeolite additive in fluid catalytic cracking (FCC)



The butenes, for example, can find outlets in high octane motor gasoline components such as alkylate and ethers, whilst propene can be exploited in downstream chemicals processing.

This developing technology is an interesting example of two different types of zeolites with complementary catalytic functions being used within the same process.

Hydrotreating

Fluid catalytic cracking (FCC) is the most widely applied method for producing gasoline, lower olefins and gasoil components from heavy petroleum distillates and residues.

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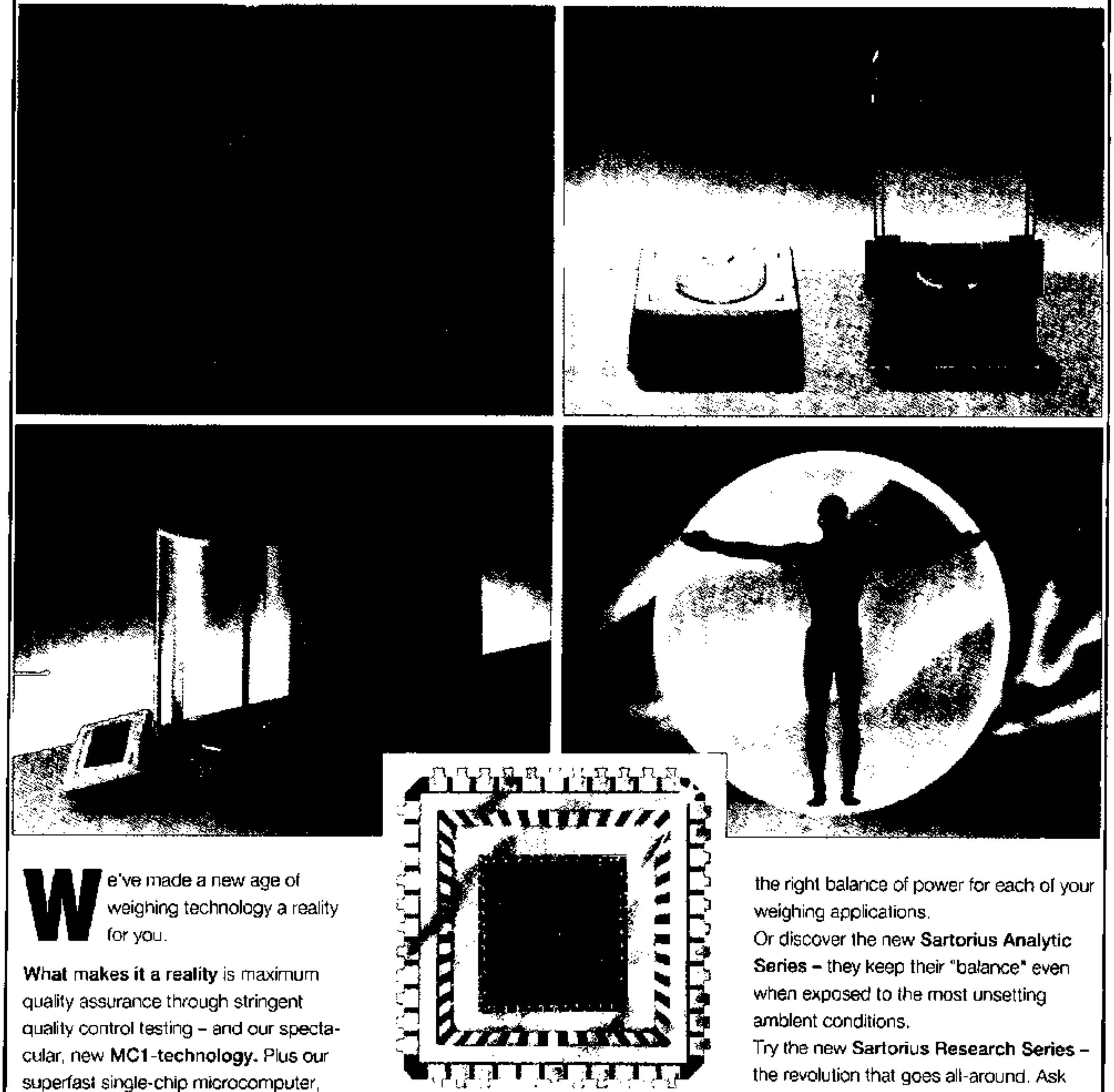

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The product quality requirements can be achieved through hydrotreating (also known as hydroprocessing).

For middle distillate products, which include gasoil and diesel fuel, the trend is towards reduced sulfur, and high cetane levels which can be achieved by reduced aromatic content.

Conventional middle distillate hydrogenation catalysts, which contain noble-metals, can be used to reduce levels of aromatics. However, these catalysts are poisoned by even low levels of hetero-atom (sulfur and nitrogen) impurities. Such catalysts therefore demand extensive pretreatment, adding to processing costs.
To resolve this problem, a new noble-metal zeolite catalyst has been developed within Shell Research laboratories, which has substantially improved tolerance to feedstock impurities. This novel catalyst is used in a two-stage process, with minimal pretreatment, to hydrogenate aromatic components in diesel fuels. In response to increasingly stringent regulations in Sweden regarding diesel fuel properties, a plant for such a two-stage hydrotreating process (Figure 9) has recently been commissioned there.

Figure 9

Two stage hydrotreating process for low aromatics diesel production

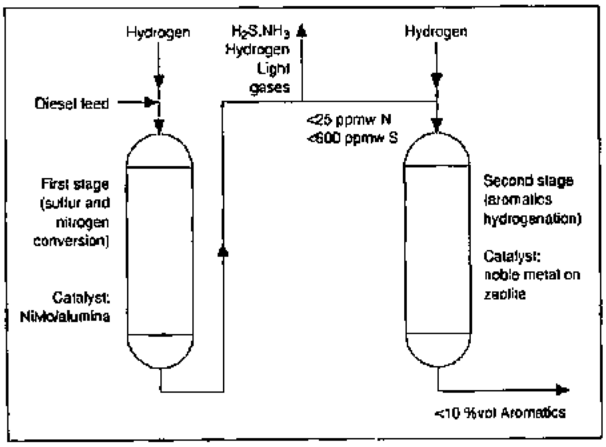
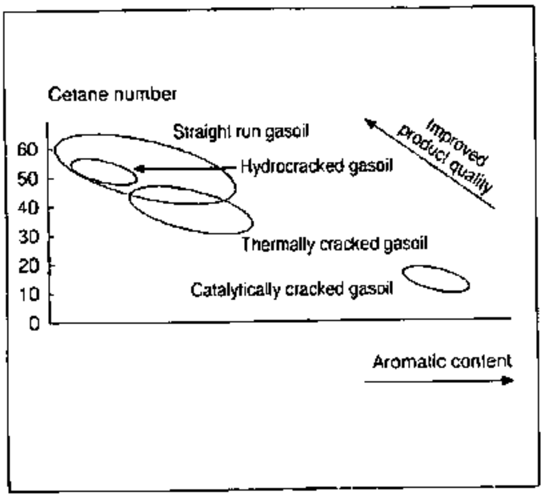


Figure 10

Hydrocracker gasoil quality



Hydrocracking

Hydrocracking involves cracking and hydrotreating feedstocks within the same process, both of which occur under hydrogen pressure. This process has increased in importance - particularly in the Pacific Basin and Indian continent - for converting heavy feedstocks into high quality middle distillate products. (Figure 10)

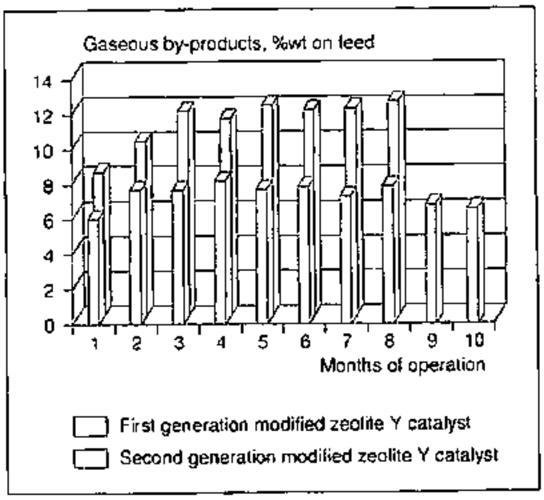
Zeolites offer significant advantages as cracking catalysts in this process, particularly as they are inherently resistant to coke formation and hetero-atom poisoning. However, the selectivity of such catalysts to middle distillate products has, in general, been poor. In recent years, Shell Research has developed a new family of hydrocracking catalysts which can be tailored to:

- the process design;
- feedstock type; and
- product range requirements of the individual application.

Such catalyst systems are now being incorporated into Shell and third party hydrocrackers worldwide. The extent to which performance can be improved in commercial operation is significant (Figure 11).

Figure 11

Commercial performance of first and second generation zeolitic hydrocracking catalysts



Compared to first generation catalysts the modified zeolites offer:

- reduced gaseous by-products;
- increased middle distillate or naphtha selectivity; and
- improved stability.

Such improvements in catalyst performance exert a major impact on the economics of a hydrocracking plant.

MOLECULAR MODELLING

The remarkably highly-ordered structural features of zeolites and the possibility of tailoring their acidity to suit a particular process are valuable catalytic properties. In addition, the near molecular dimensions of zeolite pores make it possible for zeolites to distinguish between different sized molecules of either feedstock, intermediate or product, thereby forming the basis for shape selective catalysis. Theoretical studies aimed at understanding these catalytic functions at a molecular level have received a great deal of attention. A global molecular picture of a catalytic process in a zeolite comprises several elementary steps:

* diffusion of the reactant molecules into the zeolite pores;
* absorption on the active sites in the zeolite;
* the catalytic reaction;
* desorption of the product molecules from the active sites in the zeolite; and
* diffusion of the product molecules out of the zeolite pores.

Using theoretical techniques it is possible to study each of these steps separately, something that cannot usually be done experimentally. This can provide a valuable insight into experimental results.

The advent of computer aided molecular modelling (CAMM) has increased the potential of theoretical contributions to zeolite catalysis research. CAMM is performed on powerful three-dimensional graphics workstations in conjunction with sophisticated modelling software. The theoretical techniques now available range from the simulation of analytical experiments, such as X-ray diffraction experiments for determining crystal structures of zeolites, to quantum chemical methods, which can be used to calculate the transition states and energy barriers of catalytic reactions. Combining such techniques on a single computer system, and visualising both the input models and calculated results, has added a new dimension to catalysis research. For example, the visualisation of geometric constraints for molecules in a zeolite lattice represents an important step forward. The advanced understanding of catalytic processes at a molecular level is valuable in research related to zeolite catalysis. A further stimulus in this area is the continued discovery of new synthetic zeolites and molecular sieve materials.

CONCLUSION

Zeolite catalysts are now well established in oil refining and offer significant economic benefits. In addition to the existing applications, it is anticipated that new opportunities will arise to exploit their unique properties in producing higher quality fuels.

Acknowledgement

European Shell Research laboratories involved in zeolite catalysis and transportation fuels research and development are:

Koninklijke/Shell-Laboratorium Amsterdam Netherlands) and Grand-Couronne (France) - zeolite catalyst and process research;

Thornton (UK) - fuel technology and product development; and

PAE Hamburg (Germany) - fuel products development.

BIODETERIORATION OF HYDROCARBON FUELS

G. Hettige, Biological Consultant, P.O. Box 131-68, Johnsonville, Wellington.

All heterotrophic micro-organisms, whether bacteria or fungi, have similar general requirements for growth. They require a source of organic carbon to supply both carbon skeletons for the formation of new cell constituents and to provide the necessary energy following partial or complete oxidation. Such organisms have been called chemoorganotrophs (Hawker and Linton, 1979). Hydrocarbon fuels contain between 80% and 89% carbon (King and McKenzie, 1977) and thus should be able to provide an excellent source of carbon energy. However they vary in their susceptibility to microbial degradation.

Certain organic materials which are now quite common environmental contaminants were not always so common, and the hydrocarbons which comprise the various types of modern liquid fuels are prime examples. In recent years due to the rapid development in industry, transportation and naval activity, large quantities of fuel are stored for long periods providing a man-made environment where micro-organisms can thrive. Many other man-made organic molecules such as plastics and other synthetic materials widely used by man provide even more recent additions to the environment and many be capable of forming a substrate for microbial growth. The ability of micro-organisms to metabolise hydrocarbons was demonstrated long ago by Miyoshi (1895). It has been shown that a range of microbial species have the capacity to break down various hydrocarbons (Foster, 1962).

Aliphatic and long chain hydrocarbons appear to be more susceptible to microbial attack than aromatic and short chain hydrocarbons. Molecules containing from 10 to 18 carbons are attacked more frequently and rapidly, and they support abundant microbial growth (Lukins, 1962). The reason fuel containing aromatic hydrocarbons is less readily attacked, may perhaps be due to toxicity or the requirement for more specialised enzymes to degrade such compounds (ZoBell, 1950). Other nutrients namely nitrogen, phosphorus, potassium and trace elements are less abundant in fuel, although their levels may be supplemented by fuel additives, rubber, paints, human waste and seawater (Hill and Hughes, 1969).

It is, therefore, not surprising to find micro-organisms associated with aviation fuels (gasoline and kerosene in both subsonic and supersonic aircraft and in storage tanks), diesel fuel (middle distillate fuel) in storage, in road and rail vehicles, diesel generators, central heating fuel and diesel fuel on board ships, particularly where water displacement is used in order to maintain a consistent 'trim'. Green et al. (1967) reported that rocket propellants were also susceptible to microbial attack. The hydrocarbons are predominantly aliphatic but in some fuels, a high content of aromatic hydrocarbon may by present, for example some jet fuel contains 25% aromatics.

The additives which may be present in the aviation fuels include anti-oxidants, metal de-activators, corrosion inhibitors, anti-statics and anti-icing agents. The term 'diesel fuel' covers a wide range of differing hydrocarbon blends, some of which may also contain cetane number improvers and corrosion inhibitors (Genner and Hill, 1981).

Fungi and bacteria identified as contaminants of jet fuel and jet fuel-water samples are listed by Sharpley (1966) and by Sheridan et al (1971a). Hormoconis resinae was the predominant fungus found in around 80% of all samples tested (Hazzard 1963; Engel and Swatek, 1966). Hazzard (1963) found Paecilomyces sp. in 55 out of 599 samples of aviation kerosene during a survey of 45 air fields in Australia and the Far East. He and other workers also found Penicillium spp. in fuels but they attached little significance to these fungi. In a survey of New Zealand jet fuel in 1972-73 Sheridan and Soteros (1974) found H. resinae, Penicillium spp. and Paecilomyces sp. in 96%, 85% and 51% of samples respectively.

Microbial contaminants probably appeared in diesel fuel at the same time as in aviation fuel but because the fuel was used in less sophisticated diesel engines it possibly passed unnoticed. Hence less work has been done until recently in connection with diesel fuel. H. resinae was found to be the major contaminant (Houghton and Gage, 1979; Neihoff, 1980; Bruce, 1982: Arnold, 1983). In reporting H. resinae as the major contaminant of diesel fuel Bruce (1982) suggested that

Penicillium spp. might be as important. In New Zealand Hettige and Sheridan (1984) reported the fungi H. resinae, Penicillium spp. and Paecilomyces variotii in 98%, 93% and 50% of samples respectively of stored diesel fuel. Further growth studies indicated the Penicillium corylophilum and Paecilomyces variotii would grow well in diesel fuel under certain conditions producing a mat of mycelium similar to that of H. resinae.

However, fuel spoilage can also be caused by bacteria (Smith, 1988). The fuel degrading bacteria such as Pseudomonas fluoresces, P. maliphora and Alcaligenes sp. are associated with the formation of prolific membranous material believed to be a polysaccharide or lipopolysaccharide at the oil/water interface. The consequences of spoilage by membrane polymer forming bacteria are blockage of fuel filters by the sheets of suspended polymer; turbidity due to suspended polymer; an unacceptably high water content in the fuel and, when held at low temperatures, a severe increase in viscosity.

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DR PEAK'S CHROMATOGRAPHY MADE EASY
"NEW NOMENCLATURE FROM IUPAC"

By Roger Whiting, Auckland Institute of Technology

A unified nomenclature for all forms of chromatography has been issued by IUPAC.

INTRODUCTION

The International Union of Pure and Applied Chemists has published a unified nomenclature for chromatography (1). This gives chromatographers a consistent set of definitions and symbols for the terms used in chromatography. It also sets up a system of rules for naming new terms and devising symbols to describe them.

The new nomenclature, although a voluntary system, will, hopefully, replace the plethora of systems used in different countries and different types of chromatography. For example, the American Society for Testing and Materials (ASTM), The British Standards Institute and IUPAC each had its own nomenclature. Also within each organisation the different types of chromatography each had its own nomenclature. The purpose of the new system is to bring together under one nomenclature all the existing terms and symbols that are used to describe the wide variety of chromatographies used today. In devising the new nomenclature an attempt has been made to incorporate these various systems as much as possible. Wherever possible old terms and symbols have been used. It has, however, been necessary to make some changes to the previous systems but this should eliminate ambiguities and prevent conflicting usage. This article outlines some of the changes that have been recommended.

One of the major problems facing the developers of a unified nomenclature for chromatography has been the way various branches of chromatography have grown up "like Topsy". New chromatographic techniques are tried, find an application and then evolve into an independent branch of chromatography. In the process the new branch develops its own system of terms which deals with the concepts in that particular branch. However, the result of this is that often the terms used in one branch have different meanings in others. Even such a basic term as solvent has different meanings in liquid chromatography where it is synonymous with the mobile phase and gas chromatography where it refers to the liquid on the solid support ie the stationary phase. Another example is *Chromatogram* which means the actual stationary phase after development in planar chromatography while in gas or liquid chromatography it refers to the graphical print out from the recorder or its electronic equivalent. Clearly there has been a need to develop a unified approach.

Symbols can be especially difficult to deal with if there is ambiguity in their meanings. Over the years many textbooks and monographs have been written on chromatography and each writer, particularly in the early years, has tended to develop their own set of symbols. This is not a major difficulty provided there is a clear definition of all terms in the text. However this is not always the case and it creates a number of opportunities for error and confusion.

SYMBOLS

The basic symbols used in the new system are founded on those specified by the Division of Physical Chemistry of IUPAC. These are used for major physical and physicochemical quantities and are shown in table 1. To these symbols a few more, relevant to chromatography, have been added. Subscripts and superscripts are then used, according to specific rules, to further differentiate the various terms.

TABLE 1: IUPAC-recommended symbols for chomatography

Term	Symbol
Area	A
Density	ρ
Diameter	d
Diffusion coefficient	D
Equilibrium (distribution) constant	K
Flow rate (volumetric)	F
Length	L
Mass (weight)	W
Peak width	w
Pressure	p
Pressure, relative	P
Radius	r
Rate constant	k
Temperature (absolute)	T
Time	t
Velocity (linear)	u
Viscosity	η
Volume	V

Superscripts T indicates data derived under temperature programmed conditions '(prime) indicates the quantity has been corrected for mobile phase hold up eg: t_R and V_R refer to the adjusted retention time and volume 0 (zero) indicates correction for gas compression in gas chromatography. Subscripts referring to physical conditions or phases should be in capitals eg M for mobile phase and S for stationary phase. R indicates retention eg t_R and V_R above.

Lowercase letters refer to the physical parts of the system:
c for column (d_c for column diameter)
p for particle (d_p for particle diameter)
Compound subscripts should be avoided as much as possible. If necessary a symbol can be added to a subscript but a subscript should never be added to a subscript.

CHANGES FROM THE EXISTING NOMENCLATURE

RETENTION FACTOR

This is now used to describe the term:

$(t_R - t_M)/t_M$

Where t_R is the total retention time and t_M is the mobile phase hold up time. A commonly used name for this was *capacity factor*. In the past the symbols k and k' have been used for this term but this is not recommended as IUPAC recommends the use of k exclusively for rate constant.

CARRIER-GAS COMPRESSION

In previous nomenclatures the name compressibility correction factor has been used to describe the term:

$$j = \frac{3}{2}\left|\frac{(p_i/p_o)^2-1}{(p_i/p_o)^2-1}\right|$$

where p_i and p_o refer to the inlet and outlet pressures of the column respectively. This expression corrects various retention volumes for the effects of carrier gas compression. The term is still described by the symbol j.

FLOW RATE

The new nomenclature recognises three volumetric flow rate terms:

F which is the flow rate measured at the column outlet, at ambient temperature and pressure.

F_a which is the volumetric flow rate corrected to dry gas conditions.

F_c which is the mobile phase flow rate corrected to column temperature.

PARTITION COEFFICIENT

In the new nomenclature it is recommended that this term be replaced by the term distribution coefficient which is recognised in three variants:

K_C which describes the partition of the analyte between both phases in terms of the concentrations per unit volume of the two phases.

K_I which is used when the stationary phase is a solid. It describes the partition of the analyte between the two phases using a concentration expressed in terms of unit weight of the solid phase.

K_S which is suitable for adsorption chromatography where the concentration of the analyte on the stationary phase is expressed in terms of unit surface area of the stationary phase.

PLATE NUMBER

Here the recommended terms are plate number and effective plate number which are given the symbols N and N_{eff}. This will avoid the confusion which has arisen in the past as various writers have interchanged the old symbols N and n which described these quantities. The term number of effective theoretical plates is no longer recommended.

RELATIVE RETENTION

There are three relative retention terms recommended in the new nomenclature. These are:

r which indicates the retention relative to a standard using the adjusted retention times and is called relative retention. It is described by the formula:

$$r = t_{Ri}'/t_{R(st)}' = K_i/k_{st}$$

α which describes the relative retention between two adjacent peaks in terms of their adjusted retention times. This is called the separation factor and is described by the formula:

$\alpha = t_{R2}'/t_{R1}' = k_2/k_1$

where $t_{R2}' > t_{R1}$

r_0 and α_0 which refer to unadjusted relative retention and unadjusted separation factor. These are the ratios of the appropriate total retention times.

CONCLUSION

The publication of this new nomenclature is an important event in the development of chromatographic science. However, it will only achieve its full significance if it is adopted by workers, writers and manufacturers in the field. All those involved in the development and use of chromatography stand to gain by better flow of information. Thus the onus is on them to use the new nomenclature. This means becoming familiar with it and ensuring it is used in personal communication and in publications generally. This article has outlined some of the changes recommended but it will be important for chromatography users to obtain the a copy of the proposed nomenclature and study it.

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GC Connections
"THE NEW IUPAC NOMENCLATURE FOR CHROMATOGRAPHY" by Leslie S Ettre

LUBRICATION OIL MONITORING VIA AUTOMATED FT-IR SPECTROMETRY

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INTRODUCTION

Spectroscopic monitoring of engine lubrication oils has long been employed in the determination of oil performance and engine wear. Using atomic spectroscopy analysis, via either flame atomic absorption, arc-spark, or inductively coupled plasma (ICP) spectroscopy, contamination of the oil by most of the metals used in the engine can be monitored, and their levels tracked. The owners or operators of the engine can then be alerted when the level of any metal, or combination of metals, becomes excessively high indicating excessive wear of one or more parts.

The use of infrared (IR) spectroscopy for routine monitoring of oil components, breakdown products, and contaminants has not been widely applied, although infrared studies of lubrication oils themselves have been performed for a number of years. There are many reasons for this lack of use, first, older dispersive IR spectrophotometers could take up to several minutes to collect a spectrum of the used oil, which would result in a sample throughput that was unacceptably low for a laboratory that may have hundreds of samples to run per day. While modern fourier-transform infrared (IR) spectrometers can collect a spectrum of the oil in a few seconds, only recently has the cost and ease of use of a commercial FT-IR spectrometer reached the point where it is of interest to a QC/QA laboratory. In addition, only with the advent of commercial FT-IR spectrometers with attached mini or microcomputers, has the tedious task of measuring the IR spectrum by hand been eliminated.

With all of the above limitations, it is surprising that IR analysis of lubrication oils has been used so much in the past. While atomic spectroscopic techniques provide information on the levels of wear metals in the oil, infrared analysis provides complementary information on the levels of oil additives, breakdown products and common contaminants, as shown in Table 1.

Preventative Maintenance and Trend Analysis Information Provided by FT-IR Spectroscopy

- Oxidation buildup
- Nitration buildup
- Soot buildup
- Sulfate/sulfonate levels
- Water and acid buildup/contamination
- Fuel contamination
- Glycol (or other coolant) contamination
- Other components, defined by operator

Table 1. Lubrication oil components monitored by FT-IR spectroscopy.

Using infrared spectroscopy, oil performance can be easily monitored both under test and actual use conditions, examining how the oil degrades under these conditions, and relating this to overall machine performance. In addition, infrared spectroscopy can provide a warning of a failure of an engine system. For example, a sudden appearance of high water levels coupled with an appearance of ethylene glycol in the oil would indicate a failure of the coolant system. Besides checking oil performance, infrared spectroscopy can be used to check the new oil for proper levels of antioxidants, antiacids, and detergents to insure that the incoming lubrication oil meets the requirements of the engine. This complementary information to wear metal analysis can be broken into three general categories. First, required oil additives such an antioxidants, antiacids and detergents can be tested to see that they meet specifications, and that these additives are still at an effective level in an operating engine. Second, common oil breakdown products such as acid formation, oxidation, nitration and soot can be individually tracked to check for excessive buildup. Third, external contaminants such as fuel, glycol, hydraulic fluid or other components can be monitored to indicate a failure of another engine system. By monitoring for all of these components, and taking appropriate actions, engine life can be extended and oil usage optimised. A secondary gain is that the observation of soot and nitration buildup indicates poor engine tuning and by rectifying this problem, fuel consumption will be lowered.

SYSTEM REQUIREMENTS

There are five requirements for an FT-IR based oil analysis system. Because many of the additives and contaminants are at low levels compared to the base oil (on the order of a few percent or less) the system must be sensitive to these levels. In addition, it must be able to accurately track these levels with high confidence when any of these component levels go outside of the normal operating range. Second, the system must be easy to operate for a laboratory technician with little or no training and should prompt for required information, check the spectrometer performance, alert the operator to any problems with the system and give advice on how to correct the problem. Third, to achieve the best possible quantitative results, the method must be easy to calibrate on a day-by-day basis, so that minor variations in the sampling system, or instrument response, do not affect the accuracy or precision of the results. Fourth, a high sample throughput (short measurement and sample changeover time) is required in order to reduce the cost per analysis. Finally, the system must be flexible enough to allow individual laboratories to adapt the system to their needs.

SENSITIVITY

In any analytical method, perhaps the greatest factor affecting the sensitivity of the method is the sampling technique. Developing an analytical method around a sampling technique that is not suited to the chemical and physical characteristics of the system will result in a procedure that will never approach the accuracy and precision of a method using the optimal sampling technique, no matter what type of advanced mathematical algorithms are applied to the data. Classically, a fixed pathlength cell has been used for the analysis of minor components, at the expense of pushing the absorption bands of the base oil off scale. These cells can be easily calibrated by a simple measurement of the fringe pattern in the spectrum of the empty cell generated by the parallel windows. However, manually filling, inserting, removing and cleaning a fixed pathlength cell results in a low sample throughput, with additional errors generated by poor reproducibility in the placement of the cell in the instrument.

One sampling method that allows for a greater sample throughput is the use of internal reflection spectroscopy (IRS), also called attenuated total reflectance, or ATR. In this technique, the infrared beam is reflected through a crystal of a high refractive index, usually ZnSe. The sample is placed on the surface of the crystal, and the infrared beam interacts with the sample on the surface. While eliminating the problem with manually filling and cleaning fixed pathlength cells, the ATR technique presents several problems that can make it undesirable for oil analysis.

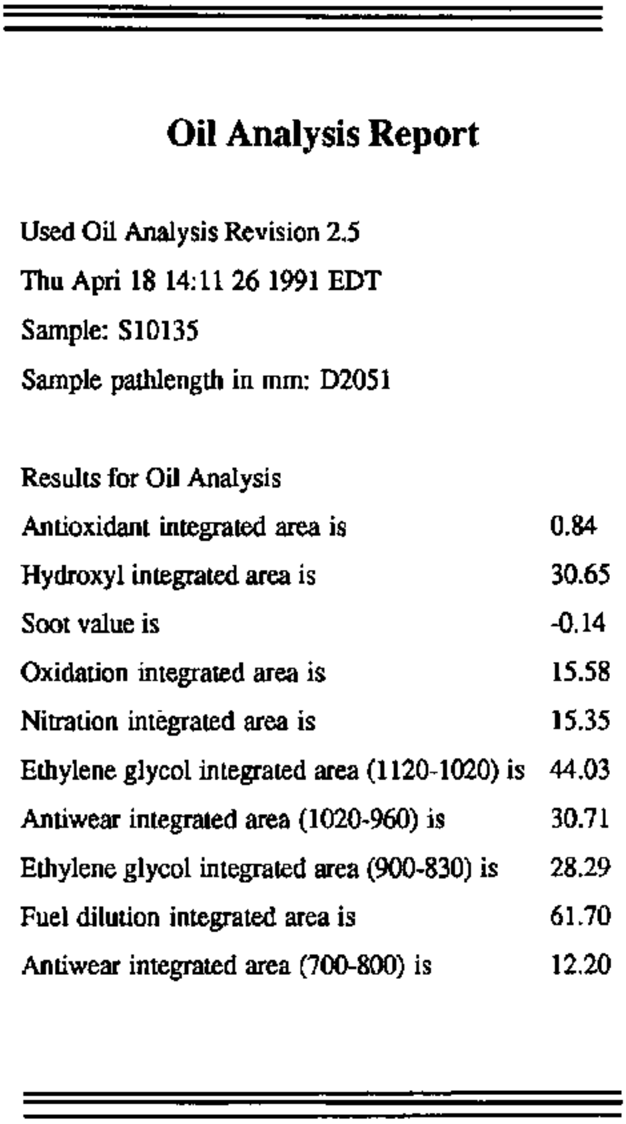
First, because ATR is a surface technique, the depth of penetration into the oil is very small (about 2 micrometers per reflection at a frequency of 1000 cm^{-1} for zinc selenide) and hence the technique is very sensitive to any thin layer of contamination on the crystal surface. To avoid problems with sample cross-contamination, it is necessary to rigorously scrub the crystal surface between samples. There is also the potential danger that suspended solids will precipitate and slowly deposit onto the horizontal crystal surface, thus being measured at a higher level than true bulk representation. The material commonly used for horizontal ATR accessories, zinc selenide, is soft enough that it can be scratched during the rigorous cleaning required between samples, necessitating reconditioning or replacement of the (expensive) crystal.

Second, the IRS technique results in a much weaker spectrum being observed than can be obtained by the transmission technique.

The last problem with the ATR method arises from the geometry of the accessory used. It is usual for such an accessory to pass much less than 20% of the infrared energy to the detector, and this optical throughput drops even further when the crystal has been in use for a while, as its surface becomes marred and pitted. The combination of low energy throughput and weak infrared absorbances results in the ATR spectrum having a signal-to-noise ratio (a measure of the band intensity relative to the baseline noise) 10 to 20 times poorer than the transmission technique. This means that the accurate measurement of relatively weak spectral information arising from the additives and wear products becomes difficult.

Unlike a simple transmission cell, the effective pathlength of an ATR crystal is determined by several complex factors which cannot be easily determined. By using the ATR technique, the sensitivity and linearity of the analysis will change over time as the crystal is used, and the crystal throughput degrades. Another serious concern arises from the long-term usage of the ATR method. Each oil sample must be manually cleaned off the crystal before the next one can be examined. Ideally this procedure would include a solvent wipe as well. Used engine oils are toxic and noxious in odour. The toxicity of such samples gives cause for concern in many laboratories, especially when long-term exposure of the operator is considered, so that if at all possible, such exposure should be minimised. In addition continuous use of solvents would necessitate the placement of the instrument under a fume extraction system.

The only limitations with a fixed pathlength cell, that of low sample throughput and reproducibility of cell placement, can be eliminated by using a fixed pathlength flow cell where the cell is permanently placed in the sample compartment, and the sample is introduced by pulling the sample through the cell with a small vacuum pump and trap arrangement. Sample cross contamination is eliminated by a simple hexane



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Oil Analysis Report

Used Oil Analysis Revision 2.5
Thu Apri 18 14:11 26 1991 EDT
Sample: S10135
Sample pathlength in mm: D2051

Results for Oil Analysis
Antioxidant integrated area is                       0.84
Hydroxyl integrated area is                         30.65
Soot value is                                       -0.14
Oxidation integrated area is                        15.58
Nitration integrated area is                        15.35
Ethylene glycol integrated area (1120-1020) is      44.03
Antiwear integrated area (1020-960) is              30.71
Ethylene glycol integrated area (900-830) is        28.29
Fuel dilution integrated area is                    61.70
Antiwear integrated area (700-800) is               12.20
```

FIGURE 1

rinse between samples. Using this arrangement, a sample throughput of 60 samples per hour can be obtained with good analytical results. This type of sampling removes the exposure of the operator to the used oils, and may be fully automated.

OIL ANALYSIS

Figure 1 shows a typical report generated by an oil analysis programme. A standard header is printed, giving the sample name, date and cell pathlength used for the analysis. After the header, a table of results for important components of the used oil are reported. This report is printed on a standard dot-matrix printer, and can also be transmitted to a central laboratory computer. The infrared spectrum of the oil contains information at various frequencies that can be correlated to the presence, or absence, of particular components. For instance, oxidation of the oil gives an increase in absorbance in the region 1800-1650 cm^{-1}. The quantitative analysis report is in the form of integrated areas, which have been found to be more accurate and precise than a simple measurement of band height or intensity. Two regions each are used for the antiwear and ethylene glycol areas to ensure that any excess contaminants that may distort the measurements in one region are identified by a corresponding low value in the other region. In other words, confidence in the measurement for these components is improved by using two independent regions.

ANTIOXIDANT LEVELS

The first value reported is for the antioxidant levels. These antioxidants are usually in the form of a hindered phenol, such a di-t-butylphenol. The hindering comes from steric hindrance of hydrogen bonding of the phenolic OH group. This causes the absorbance frequency to occur higher than is normal for hydrogen bonded OH groups, in the region of 3650 cm^{-1}. A new oil will typically have an antioxidant level showing an absorbance area up to *ca* 2 Acm^{-1}, while an oil in use will read around 1.5Acm^{-1}, and an oil whose antioxidant has been exhausted will read around 0.2 - 0.1 Acm^{-1}.

HYDROXYL LEVELS

Below the antioxidant region in the infrared spectrum, absorbance from hydrogen-bonded OH groups are found. This hydrogen-bonded OH typically comes from water, either from condensation of combustion by-products or from coolant system leakage, but also can be due to acid formation or alcohol contamination (such as glycol) in the lubrication oil. Examining the antioxidant region of the infrared region should produce a hydroxyl value of about 35 Acm^{-1} for an average oil, with readings above 70 Acm^{-1} excessive.

OXIDATION LEVELS

Any time organic compounds are subjected to high temperatures in the presence of oxygen, oxidation products result. These products are usually carbonyl compounds, and as such, have characteristic infrared absorbances. The oil analysis program monitors the carbonyl region for a measurement of the oxidation levels in a used lubrication oil. Overall, an oxidation of 30 Acm^{-1} is typical, with values in excess of 70 A cm^{-1} considered high. Also it must be noted that imide additives show a strong absorption in the carbonyl region; thus this spectral region often shows significant features, even for a fresh oil.

NITRATION LEVELS

In addition to the oxidation products formed above, nitration products are also formed any time the above conditions are met with the additional presence of nitrogen. These nitrates and nitro compounds are due to incorrect combustion/carburetion, and have been related to the varnishing and sludging properties of the oil. These are also important, but still poorly defined, species to monitor. The nitration products have a characteristic absorbance in the infrared spectrum just below the carbonyl region, and are monitored by the same method as the oxidation products.

Lubrication oils will show nitration levels typically about 20Acm^{-1}, with values of 40 Acm^{-1} and above excessive.

SOOT LEVELS

Any time a too rich fuel/air mixture is burned in an internal combustion engine, soot particulates are formed. Soot build-up is a problem in lubrication oils as it changes the viscosity, and prematurely clogs filters. One characteristic feature of soot is the lack of any specific infrared absorption bands. Rather, these soot particles cause a general scattering of the infrared radiation which is more severe at higher frequencies (shorter wavelengths). This frequency dependent scattering causes a tilt in the baseline of the spectrum of the used oil and can be used to determine relative soot levels.

Measuring the relative soot level is just a matter of expressing the baseline tilt over the range of 4000-2000 cm^{-1}, which is reported presently as a negative value. An average oil will have about 0.2 absorbance units of tilt over this region, with an excessive level of soot producing a tilt of-0.8 absorbance units between 4000-2000 cm^{-1}.

FUEL LEVELS

In an internal combustion engine some components of the fuel used will always be found in the lubrication oil. This contamination is usually due to blow-by of the gases from the piston rings, although it can also occur from a leaky fuel pump and accidental or deliberate dilution of the lubrication oil.

Since the fuels used in a diesel or gasoline engine are simple hydrocarbons, their major absorbances will be similar to the strong CH absorbances of the base oil. However, all fuels also contain some aromatic components. Since these aromatic components will vary from batch to batch, a direct determination of fuel contamination cannot be performed without the suspect fuel. In addition the extreme conditions encountered in an internal combustion engine will alter the composition of the fuel used, requiring the fuel tested to be placed under the same conditions as found in the engine. This is almost impossible for most QC/QA laboratories.

However, an exact value for fuel contamination is not needed, only a relative measure of possible fuel contamination. Using the spectral features due to the higher molecular weight aromatic components of fuel, not lost under the high temperature conditions found in the engine, a relative value for fuel contamination can be estimated from the infrared spectrum. Readings for fuel contamination should be about 50 Acm^{-1} with a reading of 70 Acm^{-1}, or greater, indicating a significant and possible serious fuel contamination problem.

SYSTEM FLEXIBILITY

While a general oil analysis system based upon a FT-IR spectrometer can give a wealth of information on the quality and performance of lubrication oils in a QC/QA laboratory environment, it should be remembered that FT-IR spectroscopy can also give the lubrication engineer or scientist additional information outside the normal oil analysis environment. This information is available to any laboratory using a FT-IR spectrometer. It requires that the system have the flexibility to perform routine analysis without sacrificing the potential information that can be gained from other FT-IR based analysis methods. This flexibility means that the laboratory is able to easily modify the analysis routine to match their needs or protocols, and adapt the analysis to measure those components in which it is interested.

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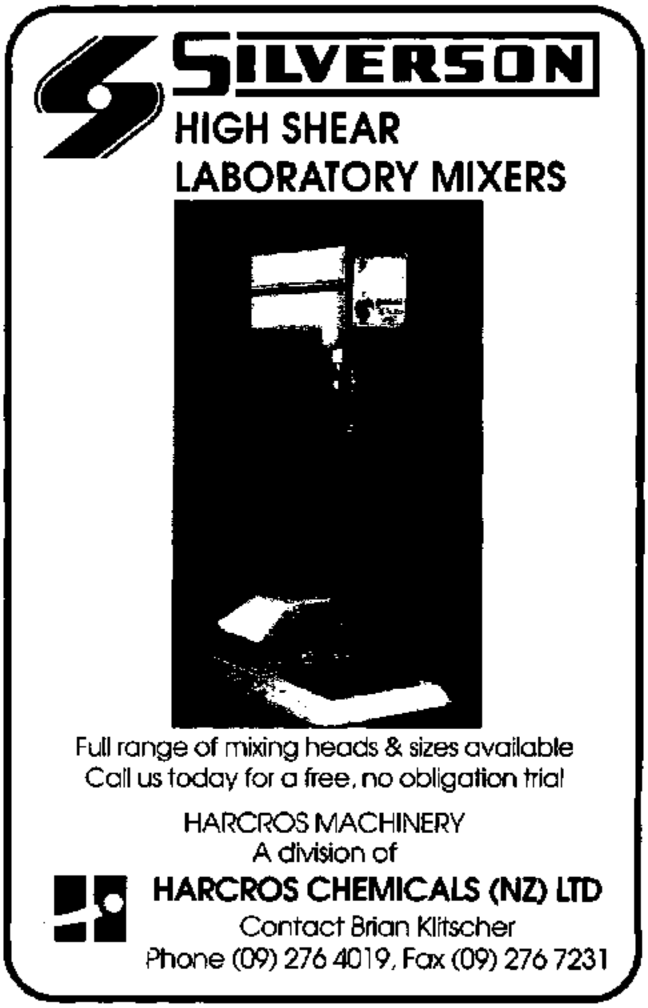


RECENT ADVANCES IN THE DETERMINATION OF TOTAL PETROLEUM HYDROCARBONS IN SOIL

M G Fitzpatrick and S S Tan
Allan Aspell & Associates

Total petroleum hydrocarbons (TPH) in soils and sediments have most often been determined by Soxhlet extraction of the dried material and subsequent measurement of the extract by infrared spectrophotometry. Extraction is typically performed using the solvent Freon-113; this extract is treated with silica gel to remove polar components, and its hydrocarbon content is determined by measurement of its infrared absorbance at 2930 cm^{-1} against a reference hydrocarbon mixture(1,2).

The soxhlet-infrared methodology presents unsatisfactory aspects in both its extraction and measurement phases to the analyst and the client alike: For the analyst, while this methodology has gained wide acceptance by virtue of its simplicity, its acceptability as an analytical method is doubtful given the protracted time-frame of the extraction (4h) and the imperative to cease the use of Freon, a chlorofluorocarbon (CFC). (In the US last year, an estimated 30,000 litres of Freon was used in the analysis of TPH by this method). Recoveries for the extraction are poor both below C_{10} due to excessive volatilisation, and in the heavy oil range due to incomplete solubilisation. The measurement phase is itself often protracted due to the limited dynamic range of the technique, necessitating serial dilution to bring the absorbance reading into an acceptable range.

For the client, the freon-infrared methodology is manifestly limited in terms of the information it can deliver: In particular, (i) the wavelength of the infrared absorption specified in the method strongly favours detection of aliphatic over aromatic hydrocarbons to the extent that the method should be considered unsuitable for the quantitation of TPH contamination where this is mainly attributable to aromatics; (ii) the presentation of the analytical result as an overall figure means that the recipient has no opportunity to assess the type of hydrocarbon contamination present.

The United States Environmental Protection Agency (USEPA) has recently responded by the introduction of new methodology(3) for the extraction of petroleum hydrocarbons in soil using super-critical fluid (SFE): The extraction medium, super-critical carbon dioxide, offers a combination of excellent solubilisation properties coupled with permeation properties superior to those of an organic solvent. This technique at once eliminates the use of Freon from the extraction step while providing useful recoveries of hydrocarbons down to C_7 and up to at least C_{44}. The extract so obtained can be determined according to the conventional infrared spectrophotometric method if so desired(2), provided the capturing solvent is transparent to infrared light at 2930 cm^{-1}. Published recoveries(4) have been typically greater than 95%. In general the SFE approach recovers a greater proportion of the low and high boiling range hydrocarbon fractions than the Freon-infrared method.

Analysis of the extract instead by GC-FID(5) yields a total recoverable hydrocarbon result fundamentally different to that which is obtained by infrared spectroscopy.

Firstly the TPH value incorporates all aromatic hydrocarbons including those that may not be detected at 2930 cm^{-1}. Secondly, by inspection of the chromatogram, the contributing hydrocarbon fractions to the TPH in the sample can be readily visualised. Therefore, the source of soil contamination can more readily be identified. For example Figure 1 below is a chromatogram of a sample extract that shows the presence of petrol, diesel and oil.

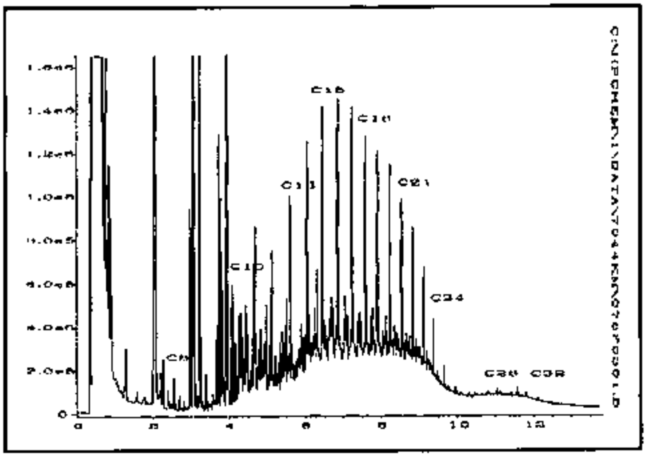


Figure 1: Soil extract in hexane

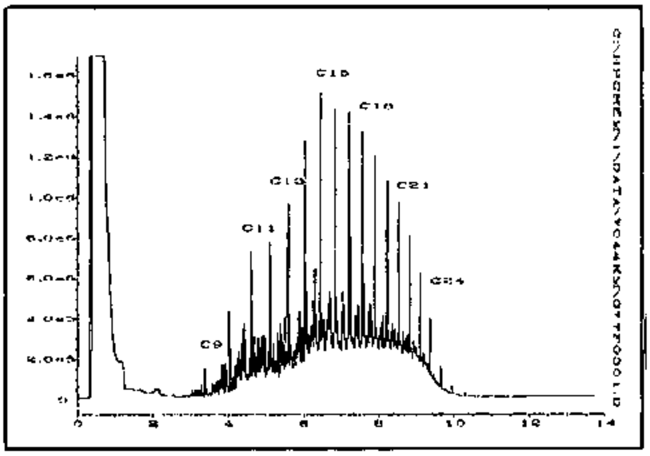


Figure 2: Diesel in hexane

Figure 2, for comparison, shows a reference chromatogram of diesel only. Table 1 gives a breakdown of the hydrocarbon fractions contained in the sample and the TPH value.

A third advantage of analysis of the TPH extract by GC-FID instead of infrared spectroscopy is a consequence of the high level of automation readily attainable for GC-FID and the fact that time-consuming dilutions are not required by this method. In terms of sample throughput, supercritical fluid extraction coupled with GC-FID is potentially far superior.

Fraction		Sample
C_7 - C_9	(%)	22.3
C_{10} - C_{11}	(%)	13.7
C_{12} - C_{14}	(%)	15.6
C_{15} - C_{22}	(%)	40.5
C_{23} - C_{28}	(%)	5.3
C_{29} - C_{32}	(%)	2.6
C_{33} - C_{44}	(%)	<0.1
TPH	(mg/kg dry wt)	1220

Table 1: *TPH Distribution (Refer Figure 1)*

In this laboratory USEPA procedure 3560 has been fully implemented, using a Dionex-703 SFE system: This is capable of extracting eight samples concurrently over the prescribed 30 minute extraction time. The extract is captured in a chilled solvent and treated with silica gel before it is ready for analysis by either infrared spectrophotometry or GC-FID.

In preference to the infra-red determination, this laboratory now advocates quantitation by GC-FID, USEPA method 8015. Processing is on a HP5890 GC-FID with autosampler capability; results are presented on hard-copy by computerised compilation and provide the client with, in addition to the conventional TPH data, a specimen chromatogram and a table of TPH abundance versus hydrocarbon group in the range C_7 to C_{44}. Because both the extraction and analysis steps are fully automated this technique can be offered at a similar cost to the Soxhlet-IR method.

SUMMARY

Soxhlet extraction has been the standard method for the separation of petroleum hydrocarbons from soils and sediments. The elimination of chlorofluorohydrocarbons will ultimately require an alternate solvent or extraction procedure. Supercritical fluid extraction will play an increasing role in analysis in the years to come and offers such an alternative procedure. Measurement thereafter of the TPH extract by infrared spectroscopy, although a useful technique is limited, firstly in the information it yields and secondly by its dependence on Freon-113. These limitations can be overcome by adopting measurement by GC-FID.

REFERENCES

1. USEPA method 9071/9071A: *Oil and Grease Extraction Method for Sludge Samples.*

2. USEPA method 8440: *Total Recoverable Petroleum Hydrocarbons by Infrared Spectrophotometry.*

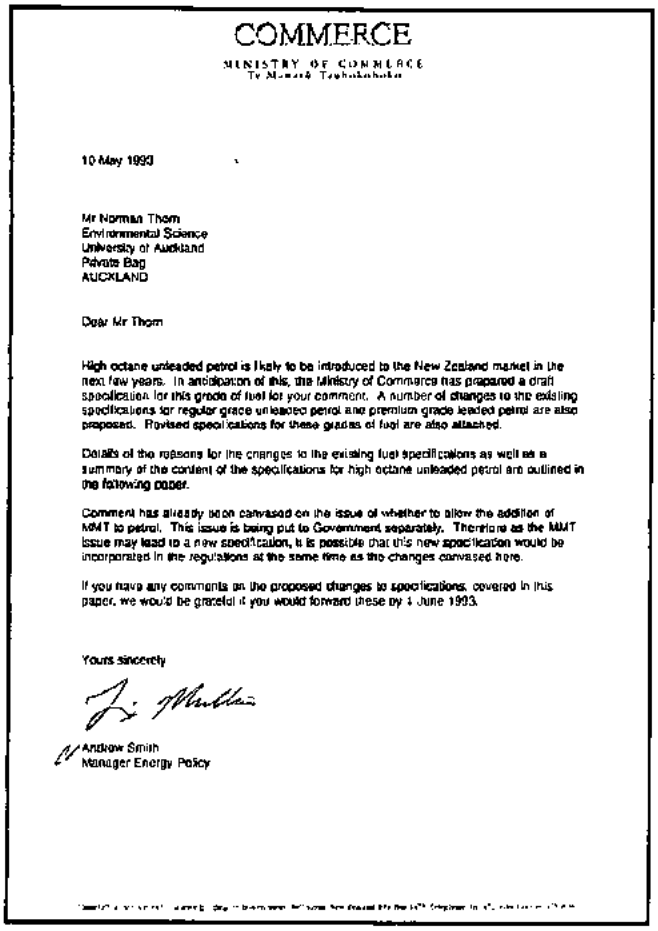
3. USEPA method 3560: *Supercritical Fluid Extraction of Total Recoverable Petroleum Hydrocarbons.*

4. V. Lopez-Avila, J. Benedicto, N.S. Dodhiwala, R. Young and W.F. Beckert. J. Chromatogr. Sci. 30, 335 (1992).

5. USEPA method 8015: *Non Halogenated Organics by Gas Chromatography.*

THE INTRODUCTION OF UNLEADED HIGH OCTANE PETROL

Unleaded high octane (premium) grade petrol will be introduced in New Zealand at some time in the next few years. This article outlines the correspondence that the NZIC has had with the government regarding new regulations for unleaded petrol to date and indicates that the introduction of unleaded premium grade petrol may not be a rapid process.



COMMERCE
MINISTRY OF COMMERCE
Te Manatū Tauhokohoko

10 May 1993

Mr Norman Thom
Environmental Science
University of Auckland
Private Bag
AUCKLAND

Dear Mr Thom

High octane unleaded petrol is likely to be introduced to the New Zealand market in the next few years. In anticipation of this, the Ministry of Commerce has prepared a draft specification for this grade of fuel for your comment. A number of changes to the existing specifications for regular grade unleaded petrol and premium grade leaded petrol are also proposed. Revised specifications for these grades of fuel are also attached.

Details of the reasons for the changes to the existing fuel specifications as well as a summary of the content of the specifications for high octane unleaded petrol are outlined in the following paper.

Comment has already been canvased on the issue of whether to allow the addition of MMT to petrol. This issue is being put to Government separately. Therefore as the MMT issue may lead to a new specification, it is possible that this new specification would be incorporated in the regulations at the same time as the changes canvased here.

If you have any comments on the proposed changes to specifications, covered in this paper, we would be grateful if you would forward these by 4 June 1993.

Yours sincerely

Andrew Smith
Manager Energy Policy

The following are proposed amendments to The Ministry of Energy Regulations, 1988, by Andrew Smith, Manager of Energy Policy, Ministry of Commerce, Wellington.

AMENDMENTS TO THE MINISTRY OF ENERGY (PETROLEUM PRODUCTS SPECIFICATIONS) REGULATIONS 1988

1. Introduction

With the introduction of high octane unleaded petrol likely in the next few years, there is a need for a specification for this grade of petrol to be developed. Additionally, some amendments to existing specifications are required. The purpose of this paper is to outline the proposed changes to specifications and seek any final comment prior to their presentation to the Government for consideration.

2. Consultation

A seminar at which the proposed amendments to the Regulations were discussed was convened by the Ministry of Commerce in August, 1992. Interested parties attended and provided their views. Preliminary conclusions were reached on the amendments necessary. These have been taken into account in preparing this report and the draft revised fuel specifications which are attached to this report.

The views of interested parties were sought and revised specifications will be put to the Government for consideration.

3. Attachments

The details on the revised draft specifications proposed are appended to this paper as set out below:

Appendix 1: Requirements for premium grade unleaded petrol.
Appendix 2: Requirements for regular grade unleaded petrol.
Appendix 3: Requirements for leaded petrol.

4. Timing of new Regulations

Amongst the changes to the specifications which are proposed is one relating to colour. (Discussed later). As a longer time than usual will be required to effect this change, the Ministry of Commerce proposes that the Regulations will come into force at a date six months from the date of promulgation.

5. Specification for premium grade, unleaded petrol

The Ministry of Commerce proposes that the fuel specification for high octane unleaded petrol be promulgated as an addition to the existing fuel specifications for high octane leaded petrol and low octane unleaded petrol. However, it is recognised that oil companies are unlikely to wish to supply three grades of petrol and are likely to cease supply of high octane leaded petrol, once they begin to supply high octane unleaded petrol.

Putting the fuel specification for high octane unleaded petrol in place in the near future will allow companies to plan the move to unleaded petrol, including the preparation of material to inform motorists of the situation.

Currently a significant proportion of the New Zealand vehicle fleet still consists of older vehicles which are fitted with soft valve seats and rely on the lead in petrol for valve lubrication. Once leaded petrol is no longer available, it will be necessary for hardened valve seat inserts to be fitted in these vehicles or a substitute non-lead-based valve lubricant to be used. Information from the oil industry suggests that it will be possible for them to provide substitutes for dispensing at filling station forecourts.

The draft specification proposed by the Ministry of Commerce includes Research Octane Number (RON) 95 minimum and Motor Octane Number (MON) 85 minimum. It is recognised that a number of older vehicles may require petrol of slightly higher RON/MON. As the fuel specification sets a minimum, rather than a maximum or actual, for RON and MON, this would not preclude the petrol suppliers from supplying petrol at higher RON and MON levels, if, in their judgement, the structure of the market requires this. The oil industry is likely to be responsive to the needs of its customers.

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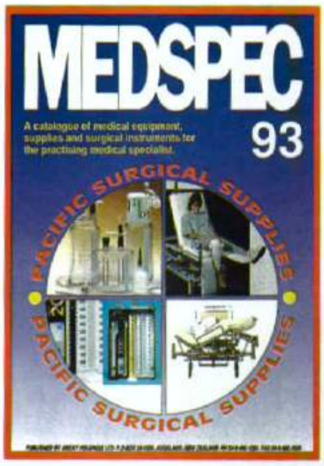

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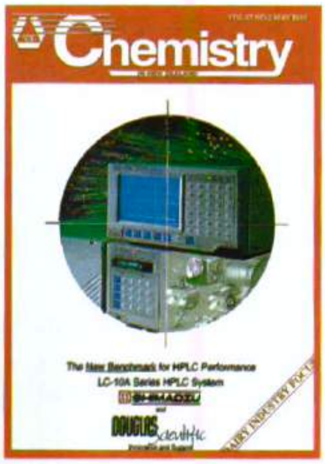

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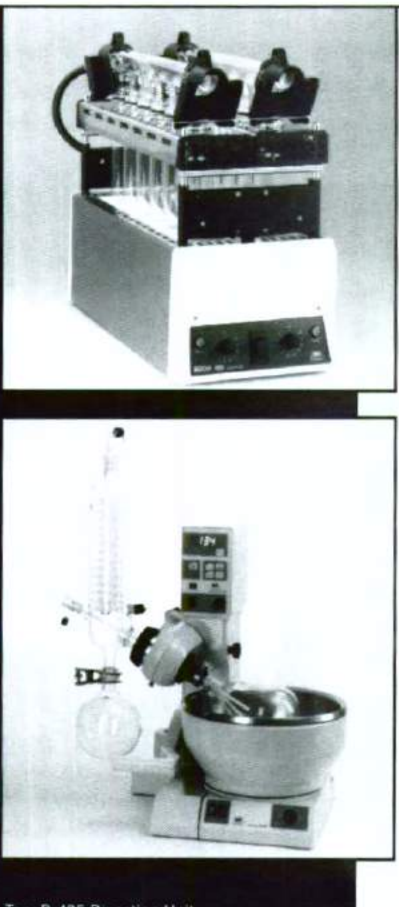

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6. Amendment to definition of unleaded petrol

The specification for low octane unleaded petrol was amended in 1991, so that the allowable lead level is now 0.013 grams/litre. However the definition of unleaded petrol in clause 2 of the principal Regulations was not amended and still shows the allowable lead level as 0.05 grams/litre. The Ministry of Commerce proposes to amend the definition in clause 2 of the Regulations to a lead content of 0.013 grams/litre, to remedy this drafting deficiency.

7. Colour

With the introduction of a new grade of petrol (high octane unleaded), it is necessary to review the colouring of petrol. It is proposed that colours consistent with Australian standards be adopted in New Zealand, to facilitate inter-country trade.

Regular unleaded petrol would then be purple in colour. This is a change from the current specification, which specifies yellow/orange as the colours for regular grade unleaded petrol. Premium grade leaded petrol would be red (unchanged from present specification). High octane unleaded petrol would be yellow.

In addition to facilitating trade in refined produce between the two countries, a lighter colouring of premium grade unleaded petrol would prevent the re-colouring of low octane petrol in order to pass it off as premium.

8. Sulphur

As high sulphur levels have the potential to cause difficulties with catalytic converters and to contribute to fuel injector clogging, a reduction of the maximum sulphur level in unleaded petrol to 0.05 percent by mass is proposed.

In addition, it is proposed that marine diesel users be given a dispensation so that they are not required to conform with the maximum sulphur levels outlined in the diesel specifications. At present, many ships in New Zealand waters are being fuelled by marine diesel purchased in foreign ports, with this diesel having a higher sulphur content than that prescribed in the New Zealand specifications. The current situation is seen to disadvantage vessels purchasing marine diesel in New Zealand ports.

The dispensation will be affected by extending the exemption in clause 3 of the Regulations.

9. Evaporation

Amendments have been suggested to ensure that petrol is of sufficiently low density as not to cause vehicle cold-start driveability problems. The petrol specifications include figures for percentage volume that evaporates at 70 degrees Celsius and 100 degrees Celsius (E70 and E100). The allowed limits are currently 15 minimum/45 maximum for E70 and 40 minimum/67 maximum for E100. It is proposed that the minimum volume level for E70 be raised to 25 and the minimum volume level for E100 be raised to 45 for all grades of petrol.

10. Flexible volatility index

It is economically desirable to allow more butane to be used in the refining process. The petrol specifications contain a flexible volatility index with a lower limit of 77.5 and a maximum of 115. It is proposed to raise the maximum to 120 for all grades of petrol as this will allow greater flexibility for butane use.

11. Avgas

Avgas is used in a number of motors, including motor car racing and jet boat racing. Current use does not conform with the specifications as the lead level is higher than that prescribed in the specifications for premium grade leaded petrol. It is proposed that a dispensation be given for fuel used for motor car and jet boat racing. The dispensation will be affected by extending the exemption in clause 3 of the Regulations.

12. Future action

Comment on the proposed specifications is sought from all interested parties. Once this has been received, the Ministry of Commerce will report to the Government with proposals. If the Government approves these proposals, amendments to the regulations will be drafted and promulgated.

Appendix 1

REQUIREMENTS FOR PREMIUM GRADE UNLEADED PETROL

PROPERTY	LIMIT	TEST METHOD
Research octane number	95.0 minimum	ASTM D 2699
Motor octane number	85.0 minimum	ASTM D 2700
Colour	Yellow	Visual
Percentage volume evaporated at 70 degrees Celsius (E70)	25 minimum 45 maximum	ASTM D 86
Percentage volume evaporated at 100 degrees Celsius (E100)	45 minimum 67 maximum	ASTM D 86
Percentage volume evaporated at 180 degrees Celsius (E180)	90 minimum	ASTM D 86
End point (degrees Celsius)	220 maximum	ASTM D 86
Residue (percentage volume)	2 maximum	ASTM D 86
Flexible volatility index [RVP(kPa) + (0.7 x E70)]	77.5 minimum 120.0 maximum	ASTM D 323 & ASTM D 86
Copper strip corrosion (2 hours at 100 degrees Celsius)	Class 1 maximum	ASTM D 130
Sulphur (percentage mass)	0.05 maximum	ASTM D 1266
Existent gum (solvent washed) (mg/100ml)	5 maximum	
Oxidation stability induction period (minutes)	240 minimum	ASTM D 525
Lead (grams per litre)	0.013 maximum	ASTM D 3341 or ASTM D 3116
Benzene (percentage mass)	5 maximum	DIN 51 413-02
Oxygenates (percentage mass)	0.1 maximum	DIN 51 413-01

Appendix 2

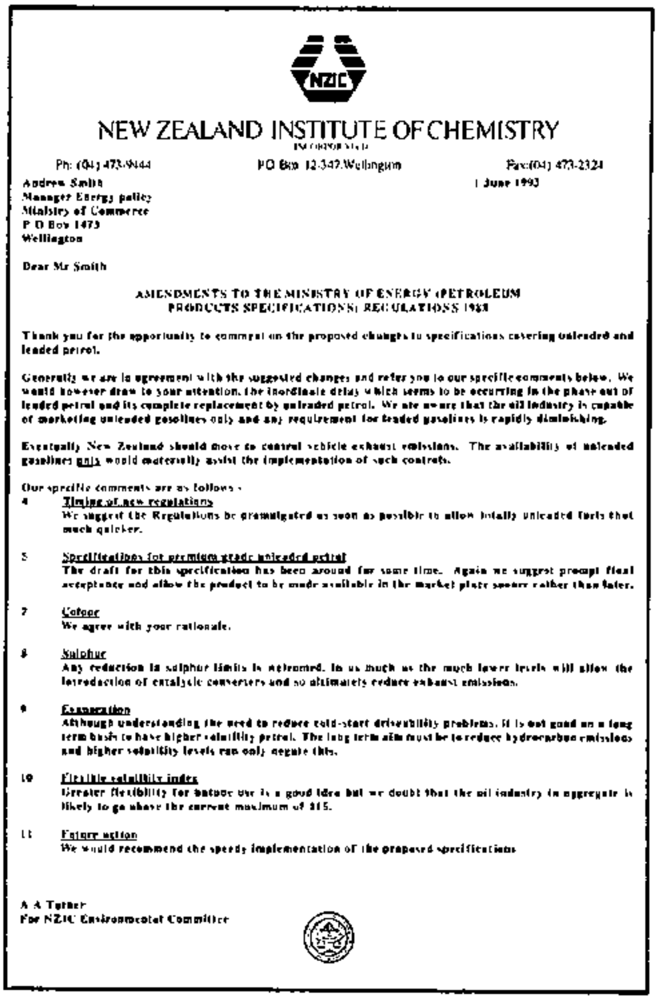
REQUIREMENTS FOR REGULAR GRADE UNLEADED PETROL

PROPERTY	LIMIT	TEST METHOD
Research octane number	91.0 minimum	ASTM D 2699
Motor octane number	82.0 minimum	ASTM D 2700
Colour	Purple	Visual
Percentage volume evaporated at 70 degrees Celsius (E70)	25 minimum 45 maximum	ASTM D 86
Percentage volume evaporated at 100 degrees Celsius (E100)	45 minimum 67 maximum	ASTM D 86
Percentage volume evaporated at 180 degrees Celsius (E180)	90 minimum	ASTM D 86
End point (degrees Celsius)	220 maximum	ASTM D 86
Residue (percentage volume)	2 maximum	ASTM D 86
Flexible volatility index [RVP(kPa) + (0.7 x E70)]	77.5 minimum 120.0 maximum	ASTM D 323 & ASTM D 86
Copper strip corrosion (2 hours at 100 degrees Celsius)	Class 1 maximum	ASTM D 130
Sulphur (percentage mass)	0.05 maximum	ASTM D 1266
Existent gum (solvent washed) (mg/100ml)	5 maximum	ASTM D 381
Oxidation stability induction period (minutes)	240 minimum	ASTM D 525
Lead (grams per litre)	0.013 maximum	ASTM D 3341 or ASTM D 3116
Benzene (percentage mass)	5 maximum	DIN 51 413-02
Oxygenates (percentage mass)	0.1 maximum	DIN 51 413-01

Appendix 3

REQUIREMENTS FOR LEADED PETROL

PROPERTY	LIMIT	TEST METHOD
Research octane number	96.0 minimum	ASTM D 2699
Motor octane number	87.0 minimum	ASTM D 2700
Colour	Red	Visual
Percentage volume evaporated at 70 degrees Celsius (E70)	25 minimum 45 maximum	ASTM D 86
Percentage volume evaporated at 100 degrees Celsius (E100)	45 minimum 67 maximum	ASTM D 86
Percentage volume evaporated at 180 degrees Celsius (E180)	90 minimum	ASTM D 86
End point (degrees Celsius)	220 maximum	ASTM D 86
Residue (percentage volume)	2 maximum	ASTM D 86
Flexible volatility index [RVP(kPa) + (0.7 x E70)]	77.5 minimum 120.0 maximum	ASTM D 323 & ASTM D 86
Copper strip corrosion (2 hours at 100 degrees Celsius)	Class 1 maximum	ASTM D 130
Sulphur (percentage mass)	0.15 maximum	ASTM D 1266
Existent gum (solvent washed) (mg/100ml)	5 maximum	ASTM D 381
Oxidation stability induction period (minutes)	240 minimum	ASTM D 525
Lead (grams per litre)	0.45 maximum	ASTM D 3341 or ASTM D 3116
Benzene (percentage mass)	5 maximum	DIN 51 413-02
Oxygenates (percentage mass)	0.1 maximum	DIN 51 413-01



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1 June 1993

Andrew Smith
Manager Energy policy
Ministry of Commerce
P O Box 1473
Wellington

Dear Mr Smith

AMENDMENTS TO THE MINISTRY OF ENERGY (PETROLEUM PRODUCTS SPECIFICATIONS) REGULATIONS 1988

Thank you for the opportunity to comment on the proposed changes to specifications covering unleaded and leaded petrol.

Generally we are in agreement with the suggested changes and refer you to our specific comments below. We would however draw to your attention the inordinate delay which seems to be occurring in the phase out of leaded petrol and its complete replacement by unleaded petrol. We are aware that the oil industry is capable of marketing unleaded gasolines only and any requirement for leaded gasolines is rapidly diminishing.

Eventually New Zealand should move to control vehicle exhaust emissions. The availability of unleaded gasolines only would materially assist the implementation of such controls.

Our specific comments are as follows -

4 Timing of new regulations
We suggest the Regulations be promulgated as soon as possible to allow totally unleaded fuels that much quicker.

5 Specifications for premium grade unleaded petrol
The draft for this specification has been around for some time. Again we suggest prompt final acceptance and allow the product to be made available in the market place sooner rather than later.

7 Colour
We agree with your rationale.

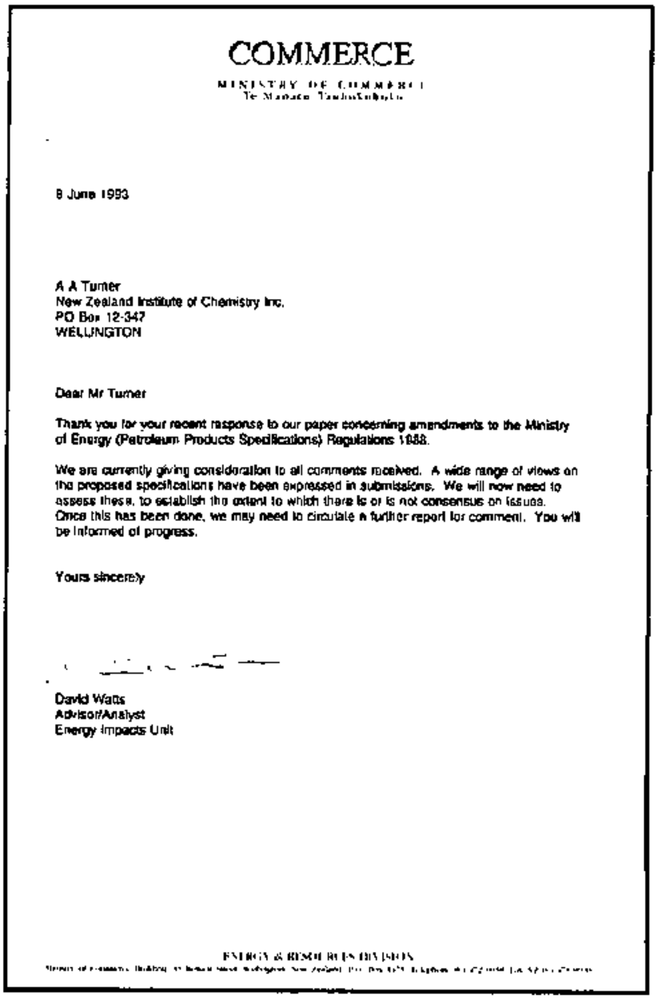
8 Sulphur
Any reduction in sulphur limits is welcomed. In as much as the much lower levels will allow the introduction of catalytic converters and so ultimately reduce exhaust emissions.

9 Evaporation
Although understanding the need to reduce cold-start driveability problems, it is not good on a long term basis to have higher volatility petrol. The long term aim must be to reduce hydrocarbon emissions and higher volatility levels can only negate this.

10 Flexible volatility index
Greater flexibility for outdoor use is a good idea but we doubt that the oil industry in aggregate is likely to go above the current maximum of 115.

11 Future action
We would recommend the speedy implementation of the proposed specifications

A A Turner
For NZIC Environmental Committee



COMMERCE
MINISTRY OF COMMERCE
Te Manatu Tauhokohoko

8 June 1993

A A Turner
New Zealand Institute of Chemistry Inc.
PO Box 12-347
WELLINGTON

Dear Mr Turner

Thank you for your recent response to our paper concerning amendments to the Ministry of Energy (Petroleum Products Specifications) Regulations 1988.

We are currently giving consideration to all comments received. A wide range of views on the proposed specifications have been expressed in submissions. We will now need to assess these, to establish the extent to which there is or is not consensus on issues. Once this has been done, we may need to circulate a further report for comment. You will be informed of progress.

Yours sincerely

David Watts
Advisor/Analyst
Energy Impacts Unit

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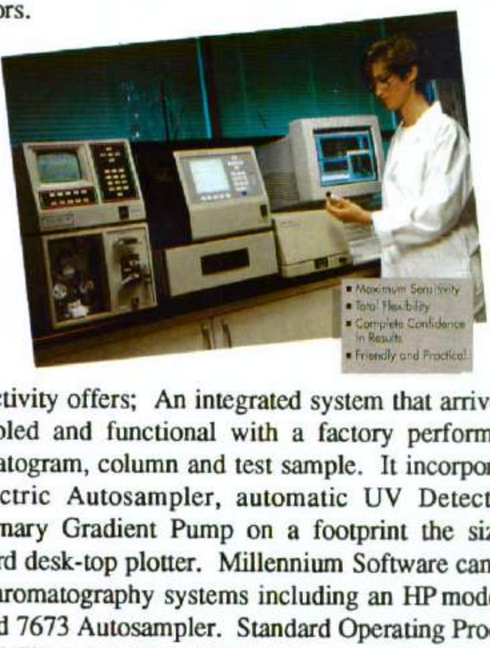

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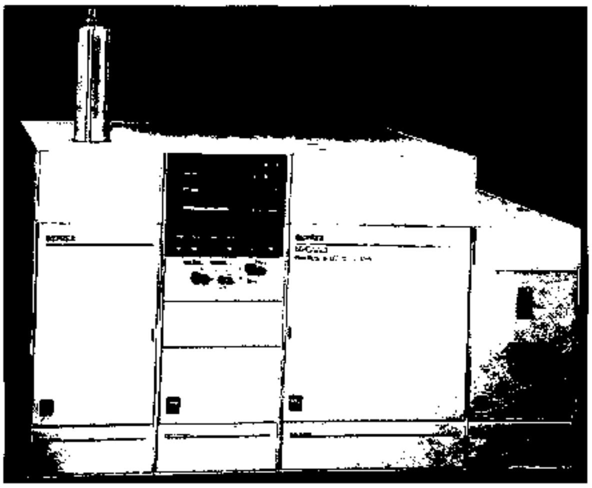
- Safe



Applicable to environmental analytes such as priority pollutants, PCB's, PAH's, and pesticides from soils, sediments and sorbents. Petroleum products such as Tinuvin, Irganox, and Irgafos additives from polyethylene, lubricants, mold release agents and antistatic agents from processed materials.

A full range of concise application methods are available upon request from Perkin Elmer N.Z.

Contact: Perkin Elmer New Zealand
P.O. Box 22-159,
Otahuhu, Auckland.
Ph. (09) 276 2230 Fax (09) 276 5602.
Or circle number 39 on the reader reply card

THE HYDRAULIC MARKET AND PARTICLE COUNTING

The hydraulic market represents an important part of HIAC/ROYCO's particle counter business.

There are two distinct types of applications in the hydraulic market. The traditional users include oil companies, manufacturers of hydraulic components such as filters and the military. Particle counters help with preventive maintenance at power companies, where large turbine generators require very clean lube oil. Dirty oil can cause turbine failure. Preventive maintenance is also needed for power transformers, where the oil must be clean to maintain cooling and dielectric properties. Another use of particle counters involves testing of oils from engines and hydraulic systems to determine wear. The military uses particle counting to sample machine oil for assessing engine wear and the need for an oil change. Of course, particle counters provide an instantaneous method for evaluating product performance. Filter manufacturers count particles upstream and downstream of filters to determine the filter efficiency and validate their product. Scores of other applications exist for these users, who already know and use particle counters.

The non-traditional applications are end-users of heavy-duty hydraulic equipment. When a company invests in excess of one million dollars in an injection moulding machine, that machine must produce at a high volume over a long time period to recoup the equipment investment. Breakdowns in such machines are expensive in terms of both lost time and repair costs. When a machine costs tens of thousands of dollars for every idle hour, investment in a particle counting system to detect problems and prevent down time becomes a necessity. The number of particles and distribution of particle sizes in the hydraulic system oil provide information on system performance as well as warnings about potential problems. Often manufacturers specify the cleanliness of system fluids in terms of particle counts or ISO (International Organisation for Standardisation) codes. End-users can periodically monitor system fluids in critical machinery using particle counters.

HIAC/ROYCO mainly sells 8011 systems (ABS-2, HRLD 400 and Model 8000) and 8012 systems (SDS, HRLD 400HC, and Model 8000) to customers who use batch sampling techniques to measure sample cleanliness. Batch sampling involves the customer drawing the sample fluid from equipment in the field or on the manufacturing floor, then sending the sample to the laboratory where the particle counting equipment is located. The new HIAC HV VersaCount, now samples hydraulic fluids on-line at the machine site. Portability, ease of use, and instantaneous results are key features of the new HV.

In the future, it is expected that particle sensors and counters will become part of the hydraulic equipment in dedicated modules. With particle counters as part of the equipment, regular fluid checks and historical data are easily obtained and distributed. This will ensure peace of mind for the operators of costly machinery as they will have an accurate picture of the condition of both their equipment and the oil they are using.
For further information on HIAC/ROYCO products, contact:

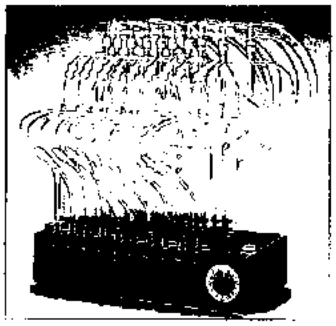
Roband Engineering Distributors Pty Ltd,
P.O. Box 31-247, Milford, Auckland.
Ph. (09) 410 444 Fax (09) 410 4937

Or circle number 40 on the reader reply card

CYANIDE DISTILLATION SYSTEMS

Perstorp Analytical Environmental announces two systems for distilling water and soil samples for the analysis of Total Cyanide and Weak Acid Dissociable (WAD) Cyanide. Reagents conform to US EPA Method 335.1 CLP-M.

The 10-place EnviroPrep 1010 (shown) and 4-place EnviroPrep 1004 Midi Distillers are complete, self-contained systems for the distillation of cyanide. The compact design of these distillers save valuable hood space: up to 10 distillations can be performed in as little as 20% of the space normally required. Reagent consumption and waste are decreased by up to 90% over previous methods.



EnviroPrep Midi Distillers are easy to use, with integrated heaters, holders, manifolds, tubing, couplings and controls. Glassware is simple to handle, clean, store, and set up.

EnviroPrep 1010 and 1004 Midi Distillers are members of the CNSolution family of integrated cyanide systems now available from Perstorp Analytical Environmental.

Contact: Science & Technology (NZ) Ltd,
P.O. Box 663, Dunedin.
Ph. (03) 477 7860 Fax (03) 477 7870.
Or circle number 42 on the reader reply card

BALSTON GAS GENERATORS

An alternative to dangerous and inconvenient cylinders.

Now available in New Zealand are the Balston range of laboratory Gas Generators which produce high purity gases for analytical instrumentation.
Balston provides the safest and purest source of >99.9998+% purity hydrogen, 99.9995% purity nitrogen and purified air for GC, FT-IR, TOC, AAS, NMR and others.

The Balston Gas Generators eliminate the need for dangerous and inconvenient cylinders and free up valuable laboratory floor space. All the systems are easy to install, operate and maintain, even by personnel not trained in instrumentation. Also available are explosion-proof models suitable for instruments located in potentially explosive environments.

Balston quality products are manufactured by Balston Inc., one of the Whatman Group of Companies in the USA. Each model incorporates the best quality components available to ensure long term reliability and trouble-free operation.

Contact: Labsupply Pierce (NZ) Ltd,
P.O. Box 34-234, Birkenhead, Auckland.
Ph. (09) 443 5867 Fax (09) 444 7314.
Or circle number 43 on the reader reply card

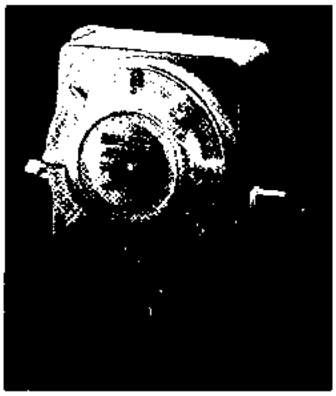
CONSTAN
THE WORD FOR "OIL SOLUBLE STANDARDS"

Constan Metallo-organic standards are specially prepared Metallo-organic standards sulphonated in an oil base. These standards are used in the calibration of instruments for the analysis of metals in oils and other organics. The variety of forms offers convenience as reference material for individual metals in: atomic absorption; X-ray fluorescence; flame spectrometry; ICP; and other emission spectrometry.
Results are traceable to NBS Standards when available and to Certified Analytical Reagent Grade chemicals when no suitable NBS Standards exist.

Contact: Biolab Scientific,
Private Bag, Northcote, Auckland.
Ph. (09) 418 3039
Fax (09) 418 0729
Free phone 0800 807 809.
Or circle number 44 on the reader reply card

BALSTON EXPLOSION PROOF ZERO AIR GENERATORS DESIGNED FOR POTENTIALLY EXPLOSIVE ENVIRONMENTS

The Balston Explosion Proof Zero Air Generator produces up to 650ml/min of high purity zero air, with a level of less than 0.1 ppm of total hydrocarbon (methane) for process analytical instruments, such as GC-FID. Operating on a standard house compressed air supply, at safe regulated pressures the system produces air on a continuous basis without the need for operator intervention.



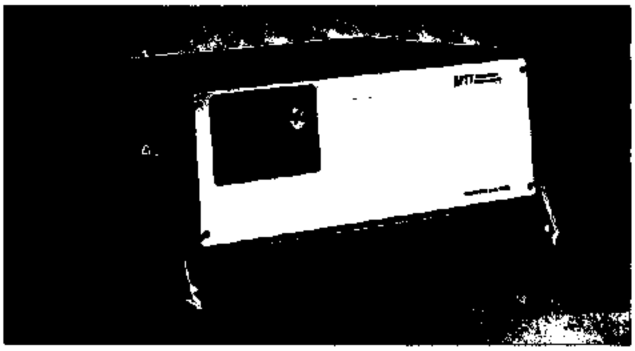
The system is housed in a standard Grouse-Hinds explosion proof enclosure designed to operate in a Class 1, Division 1, Groups B, C & D environment. This system completely eliminates the need for expensive, inconvenient and dangerous gas cylinders. It is a turnkey system, ready to be installed on Unistrut frames or mounted directly to the wall and is virtually maintenance free.

For more information on the Balston Explosion Proof Zero Air Generators, please contact your local Balston distributor:

Labsupply Pierce (NZ) Ltd,
P.O. Box 34-234, Birkenhead, Auckland.
Ph. (09) 443 5867 Fax (09) 444 7314.
Or circle number 41 on the reader reply card

QUAD 400 GAS ANALYSER, A FOUR MODULE, HIGH-SPEED GAS CHROMATOGRAPH

The Quad 400 Gas Analyser is a new, rugged, high-speed Gas Chromatograph designed to analyse complex gas samples. It is ideal for applications that require multiple columns at different temperatures, multiple sample inlets, and/or more than one carrier gas.



Four independently controlled modules (modules include injector, detector, columns & column heater) provide the ultimate in flexibility; MTI's micromachining technology provides unmatched analysis speed and total portability.

Applications:
Natural Gas Analysis - Separates and analyses C_1 - C_8, O_2, N_2, and He in less than 100 seconds.

Environmental Analysis - Fast screening of a wide range of compounds at low ppm levels isothermally.

On-line analysis - Redundant operation provides insurance against down time. Users can also monitor sample streams prior to and after process to measure sample changes.

Contact: Science & Technology (NZ) Ltd,
P.O. Box 663, Dunedin.
Ph (03) 477 7860 Fax (03) 477 7870.
Or circle number 47 on the reader reply card

REPLACE YOUR SOXHLETS WITH THE RIGHT SFX

Put away your tools - Isco's exclusive equalisation of pressure inside and outside the extraction cells lets you seal the samples with fingers instead of wrenches. Eliminating leaky fittings saves your time and patience for more important things than re-connecting and testing plumbing.

Isco SFX systems use syringe pumps for positive CO_2 metering and the most accurate on-line modifier addition. No tool sample reloading, dual chambers, and no waiting for heat-up or cool-down between extractions let you perform forty 20-minute extractions in just seven and a half hours! And you can slip in priority samples at any time - a real advantage when production decisions are waiting for analysis results.

A new automated version the SFX 3560 with 24 sample capacity, barcoded sample cartridges, and printed reports, means twenty four samples can typically be extracted overnight unattended. This delivers throughput equivalent to dozens of Soxhlets with only one hour of labour. Programmable system wash between extractions eliminates cross-contamination.

The large interactive display of the SFX 3560 sets up all extraction parameters. For method development you can automatically repeat extractions using changing parameters. Data and methods are stored on ordinary 3.5" diskettes. No computer is required.

The superior extraction conditions of SFX assures fast and clean extraction easily outperforming traditional soxhlet and sonication methods. You can expect extraction cycles of minutes instead of hours or days. CO_2 extraction eliminates regulated solvent purchase and disposal costs, along with fire and health hazards. A change for good.

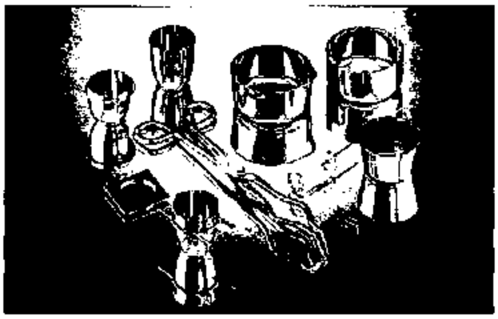
Contact:

Douglas Scientific,
P.O. Box 45-027, Auckland
Ph. (09) 837 5447 Fax (09) 837 5446.
Or circle number 49 on the reader reply card

CLAL PLATINUM LABORATORY EQUIPMENT NOW AVAILABLE IN NEW ZEALAND

The Industrial Platinum Division of CLAL are now marketing their full range of platinum laboratory equipment in New Zealand.

CLAL (Comptoir Lyon Alemand Louyot) were established over 200 years ago as a precious metals refiner specialising in the industrial applications of Gold, Platinum and Silver.



CLAL offer a wide range of crucibles, dishes and equipment. This includes alloys of the platinum group, gold and silver as well as PLATIVER YA 105, an oxide dispersion strengthened alloy containing 95% platinum and 5% gold. In addition, CLAL have a special range of crucibles for XRF analysis.

Here in New Zealand, as in Europe, you can also recycle your scrap platinum with CLAL. It can either be placed on metal account for you or else purchased or credited against your order.

CLAL have a full customer service department to help solve problems and to provide recommendations as to the most suitable materials for your process or analytical conditions.

Contact:

Industrial Precious Metal Sales
P.O. Box 18-345, GLEN INNES, Auckland
Ph. (09) 528 5867 Fax (09) 521 1364
Or circle number 48 on the reader reply card

UNBREAKABLE PLASTIC DESICCATOR

Nalgene all polycarbonate desiccators offer excellent value for money when compared to glass desiccators. Glass vacuum desiccators can cost four times as much, glass non-vacuum desiccators can cost twice as much. The Nalgene desiccator can do the work of both.

The Nalgene polycarbonate desiccator is extremely lightweight and the clear base allows for observation of desiccant colour change. But the Nalgene desiccator will not break like glass, even if accidentally knocked off the bench top. No more chipped lids! The Nalgene desiccator is 329 mm in height with an outside diameter of 280 mm. The desiccator can be used at a vacuum of 711 mm Hg for 24 hours. A silicone O-ring assures an air tight seal so no grease is required.

Contact: Medic Corporation Ltd,
Private Bag, Lower Hutt.
Ph. (04) 569 3539
Fax (04) 569 7984.
Or circle number 46 on the reader reply card

ON-LINE ANALYSIS IN THE PETROLEUM INDUSTRY FROM BRAN + LUEBBE

Refining trends: Reformulation

Severe environmental laws combined with increased consumer demand for higher octane product are forcing refiners worldwide to change their processes. Refiners are looking for ways to increase octane number without using lead. Options are more critical operation of the process units and use of new octane boosters. Internationally stricter environmental laws have gone beyond limiting lead and now will also limit the amounts of other components such as: benzene and other aromatics, heavy ends, olefins and sulfur. The demand for more critical operation of the process creates demand for more precise measurement and monitoring instrumentation to analyse and optimise the state of the process.

On-Line Octane Number Analysis for Catalytic Cracking permits control of gasoline endpoints to increase the yield of the more valuable products to balance the inventories in the blend pool. There is a trade-off between octane number and gasoline yield.

Other benefits of on-line analysis at the cracker are:

Increase unit severity conditions without overcracking (i.e. catalyst activity, circulation rate, reactor temperature)
Minimum unit variability and better control of equipment condition
Maximisation of resid in feedstocks
Longer catalyst life

Benefits of On-Line Octane Number Measurement at the Reformer Refiners must balance the yield of gasoline with target octane number. This balance is determined by the reforming severity. When the unit is operated in "low severity" condition, the yield of gasoline is higher, but the octane number is lower than when operated in a "high severity" condition. On-line control of octane number will help refiners know how to optimise these units. Other benefits of on-line analysis at the reformer are:

Maximising yields of reformate or aromatics
Controlling quality of octane or aromatics
Maximising energy efficiency and economic optimisation
Extend catalyst life by keeping octane number on target
Save intermediate tank capacity

THE BRAN + LUEBBE INFRAPRIME FOR ON-LINE OCTANE NUMBER ANALYSIS

Principle of Operation

The rapid scanning InfraPrime spectrophotometer has true dual-beam optics containing no mechanical moving parts. The Bran + Luebbe patented optical system is based on principles of Acousto-Optical Tunable Scanning (AOTS) where the birefringent crystal splits the light into two beams, each of which travels through the tellurium dioxide crystal along a different axis and interacts with an ultrasonic wave of varying frequency. As a result, the individual near infrared wavelengths or entire spectra are selected through software control.

Hardware Description

The InfraPrime system basically consists of the spectrophotometer module, the controller module and a fiber-optical flowcell or insertion probe.

Features of the Bran + Luebbe InfraPrime

Total Wavelength Flexibility via electronic tuning:
Octane number is a complicated property, requiring scanning from 900 - 1700nm to obtain the valuable information.

Speed: The InfraPrime scans up to 5000 wavelengths per second. The spectra are a result of the interaction of light with ultrasonic waves of varying frequency, so scanning does not depend on mechanical moving parts.

True Dual Beam: Ability to compensate for instrument drift, environmental condition changes and sample related drift, such as changes in crude.

Fibre optic sampling: Minimises spark hazard.

No Moving Parts: The crystal advantage.

Multiconstituent analysis: Ability to expand operation to other tests including: benzene, total aromatics and BTX.

Contact: Grant Muir
Alfa-Laval (NZ) Limited
P O Box 10 241, Hamilton
Ph. (07) 849 6020
Fax. (07) 849 6660
Or circle number 45 on the reader reply card

BENCHTOP GC-MS

If you're considering moving up to benchtop GC-MS, what are you looking for?

Our discussions with users and prospective users have resulted in the following answers to that question:

- A compact and reliable instrument.
- High Sensitivity (particularly for those people who are doing trace analysis of environmental samples or residues).
- Easy, powerful, multi-tasking software, preferably Windows based.
- Easy access to user serviceable items, particularly the ion source.
- Upgradability eg: to CI operation, wide-bore capillary, ability to accept a direct inlet probe, etc.
- Convenient automation.
- Committed and capable local support for both service and installation/training.

Douglas Scientific and Shimadzu are able to provide a resounding and convincing answer to the above requirements.

The Shimadzu QP-5000 GC-MS is the highest sensitivity quadrupole benchtop MS presently on the market, Windows-based CLASS 5000 software allows true multi-tasking and provides an easy user interface even for inexperienced MS operators. The GC plus MS unit combined have the smallest footprint in the industry, thereby saving valuable lab space. User maintenance is a piece of cake with the front panel accessible ion source and the quick vac programme for automated shutdown and restart of the whole system. This combined with standard turbo molecular pumps ensures rapid restart of the system. Douglas Scientific is making a large up-front commitment to service, sales and applications staff training to ensure top level support for this instrument's introduction into New Zealand.

Contact:

Douglas Scientific,
P.O. Box 45027, Auckland.
Ph. (09) 837 5447 Fax (09) 837 5446.

Or circle number 30 on the reader reply card

OXYGENATES ANALYSIS IN GASOLINE

The O-FID method is the EEC and EPA recommended method for the unambiguous determination of all oxygenates in gasoline. The CEN TC 19/W69 European Committee has selected O-FID as the referee method for specifications and cases of dispute because it offers the best results in terms of accuracy and precision.

The new Fisons Instruments O-FID Mega 2 Series now available offers virtually unlimited reactor lifetime by incorporating the latest in reactor technology which allows the system to operate at a much lower temperature, thus preserving the platinum catalyst and overcoming the greatest objection to competitive systems, their high maintenance cost.

The O-FID provides outstanding selectivity, sensitivity and linearity. It is also easy to use, being a single capillary column, valveless, direct-injection GC system. All annoying problems associated with column switching alternative methods are completely eliminated. The Mega 2 Series system can be equipped with the new AS800 Autosampler for liquids allowing 90 samples to be processed in a fully automated way.

Contact: Steve Lawson,
Alphatech Systems & Co. Ltd,
P.O. Box 37-583, Auckland.
Ph. (09) 377 0392 Fax (09) 309 8514.

Or circle number 31 on the reader reply card

PORTABLE pH METER FOR EXPLOSIVE ATMOSPHERES

The new CG839 portable pH meter from Schott Gerate is no larger than a pocket calculator and is approved for use in areas where explosion potential is a hazard. State-of-the-art microelectronics give the unit very low power consumption, allow some 6000 hours of continuous operation. The meter has a large LCD display for readout in pH, mV and °C and calibration and temperature compensation are automated. Reproducibility of pH is ±0.01.

The microprocessor takes temperature the dependence of electrode and buffer into account and can recognise faulty electrodes and wrong calibration buffer selections. The unit comes equipped with a leather pouch and shoulder strap and includes all the necessary accessories for use in the field or laboratory.

Contact: Labsupply Pierce (NZ) Ltd,
P.O. Box 34-234, Birkenhead, Auckland.
Ph. (09) 443 5867 Fax (09) 444 7314.

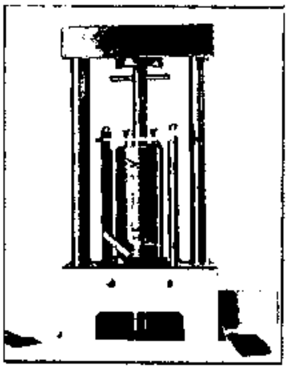
Or circle number 33 on the reader reply card

FRENCH PRESSURE CELLS AND LABORATORY PRESS

High pressure homogenisers have been used to disrupt microbiological cells for many years. With the exception of highly filamentous micro-organisms, the method has been found to be very suitable for a variety of bacteria, yeast and mycelia.

This type of homogeniser works by forcing all suspensions through a vary narrow channel or orifice under high pressure.

The higher the pressure, the higher the efficiency of disruption per pass through the instrument. The operating parameters such as temperature and pressure affect the efficiency of high pressure homogenisers. There are fewer parameters to consider than bead mill type disruption.



For complete and uniform disintegration of most biological samples the SLM-AMINCO French Pressure Cell Disruption system offers superior performance compared to ultrasonic, chemical or mechanical methods. This technique disrupts cell walls without damaging cell contents. It is easy to use and extremely cost effective.

- Capacity 1.4 - 40ml/Pressures of 20K - 40K psi
- Rapid Fill Kit for automated filling and repeated runs.

Contact:

Mr. Peter Davis,
ATA Scientific Pty. Ltd,
P.O. Box 1005,
Sutherland, NSW. 2232, Australia.
Ph. 00-61-02 717 9491 Fax 00-61-02 717 9493.

Or circle number 50 on the reader reply card

NEW, ADVANCED PARTICLE EMISSION MONITORS

Recent advances in laser technology have made available semiconductor diode lasers with collimated optics and built-in monitoring diode. MIP Oy, an innovative Finnish company specialising in the environmental monitoring business, has taken advantage of this new technology and introduced new types of dust monitoring instruments. The new family of laser monitors consists of the three models: the LM 3086 Helium-Neon laser for higher dust concentrations, the LM 3188 Semiconductor laser for low dust concentrations and the Superled LX 3188 model.

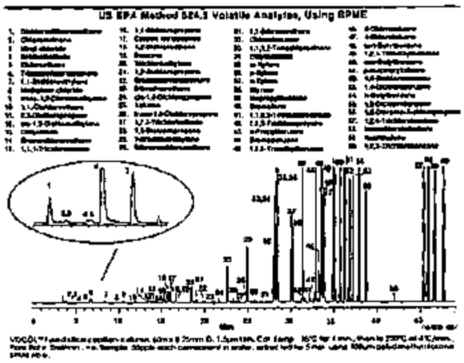
Compared to competitive systems utilising more traditional light-sources, the new laser technology improves the level of performance in many ways. Due to feedback from a power monitoring diode the lasers present at least a tenfold improvement in beam stability. This translates into an ability to measure lower concentrations of dust. The LM 3188 model offers an extended range down to 0,003 D corresponding to very low mg/m^3 dust levels. Unlike lamp light sources, the semiconductor laser can be directly modulated. This further enhances stability and renders the reception insensitive to stray light sources and background lighting. Due to the compactness of the semiconductor laser, both receiver and laser source are built into a small, easily mounted enclosure. This opens up new applications for laser dust measurements where installation space is limited. While light bulbs have a useful lifetime of around 2-3 years, semiconductor lasers have a lifetime of over 100,000 hours (over 10 years).

Due to ease of installation, lack of service problems and innovative technology, the new MIP laser dust monitors have in a short time gained good market acceptance, with over one hundred applications world-wide. These include applications for pulp and paper mill emission and process control, power and incinerator plants, oils refineries, cement and mineral industries, chemical, medical and metal industries as well as universities and research institutes.

Contact: Science & Technology (NZ) Ltd,
P.O. Box 663, Dunedin.
Ph. (03) 477 7860 Fax (03) 477 7870.

Or circle number 51 on the reader reply card

SUPELCO SOLID PHASE MICROEXTRACTION PROVIDES DIRECT, SOLVENT-FREE ANALYSIS OF ORGANIC COMPOUNDS IN AQUEOUS SAMPLES



SPME is a new patent pending technique, developed by Dr. Janusz Pawliszyn at the University of Waterloo, in which analytes are absorbed directly onto a fused-silica fiber from aqueous samples. The fiber, in a convenient syringe, is injected through the injector port of a gas chromatograph or gas chromatograph-mass spectrometer and analytes are thermally desorbed. This technology is licensed exclusively to Supelco, Inc. This rapid, quantitative technique is ideal for quick screening of samples. Sampling requires only 2 to 15 minutes for analytes to reach equilibrium in the fiber's 100um stationary phase coating, and 15ppt detection limits can be attained for most volatile compounds. Also, because the coated fibers are reusable and easily replaced, SPME is a convenient and cost-effective technique.

Contact: Chromspec Distributors Ltd,
P.O. Box 367, Warkworth.
Ph. (09) 425 9032
Fax (09) 425 9032.

Or circle number 52 on the reader reply card

THE DMA 38 - A PRECISION DENSITY METER FROM ANTON PAAR

The DMA 38 is a user-friendly microcomputer controlled density meter with built-in solid state thermometer with a degree of accuracy of ± 0.001 g/cm^3.

The DMA 38 takes care of sample temperature and correct calibration, showing you how to calibrate, and the instrument automatically calls for recalibration if it has been overlooked. The built in solid state thermostat allows temperature readout to be available for calculation and calibration, eliminates problems with external thermostat baths and saves space on the lab bench. Minimum sample size is 0.7 ml and in addition to true density the instrument can display any density-related magnitude in physical units.

Applications

- Determination of true density and density-related values
- Concentration measurement (e.g. in food, beverage, photography, pharmaceuticals, cosmetics, polymer, nuclear and petrochemical industries).
- Quality control (e.g. in pharmaceutical and general chemical industry)

A large variety of customised options is available from stock including the SP3 sample changer which allows automatic operation.

Contact: Watson Victor Limited
P O Box 1180, Wellington
Phone (04) 385 7699, Fax (04) 384 4651
or our offices in Auckland, Christchurch or Dunedin.
Or circle number 53 on the reader reply card

WEIGH SAFELY WITH SARTORIUS IN HAZARDOUS LOCATIONS

Sartorius' expertise as a manufacturer of leading edge weighing equipments has culminated in a range of high-resolution electronic balances and scales for hazardous locations.

If you go by looks alone, the third-generation Explosion-Proof models cannot be distinguished from the non-explosion-proof industrial scales and laboratory balances. That's because Sartorius' design engineers did a great inside job on meeting all the requirements for explosion safety. Ungainly and expensive enclosures are now relics of the past.

Explosion-protected Sartorius Balances and Scales are made to measure wherever you need to manufacture, process, fill refill, portion or mix hazardous materials. Now you'll no longer have to do without the convenience and premium accuracy of an electronic precision balance or scale when you're working with explosive media. Nor will you have to do without the IP 65 dust and water protection rating or heavy-duty overload protection features.

All programme functions are integrated in the scale. The labelling on the interchangeable keyboard overlays is straight forward. No more guesswork or indiscriminate button pushing. The LED's indicate which function has been activated.

Moreover, you can use any Sartorius Explosion-Proof Scale or Balance for just "ordinary" weighing.

Contact: Biolab Scientific,
Private Bag, Northcote,
Auckland.
Ph. (09) 418 3039 Fax (09) 418 0729
Free phone 0800 807 809.
Or circle number 55 on the reader reply card

THE J & W MODEL ADM 3000 A NEW MULTIPURPOSE GAS FLOWMETER FOR ADVANCED APPLICATIONS

J&W Scientific's most recent flowmeter, ADM3000, is a general purpose flowmeter designed for instant continuous digital read-out of positive and negative pressure flow rates.

The ADM 3000 flowmeter replaces mechanical and bubble meters with smart electronics, making flow measurements fast, easy and accurate, and improving productivity and quality of results.

This portable, easy to use "push button" device accurately measures both positive and negative pressure flow rates from 1.0 to 750mL/min. Unlike other flowmeters, direct calibration to NIST standards is performed using a precision standard that is annually calibrated by the NIST. Computer optimised, five point calibration assures accuracy of $\pm 3\%$ of the reading over the entire flow range. Calibration is permanently stored in read-only memory (ROM).

Rugged, light weight, and AC or battery operated, the ADM3000 is suitable for use in the field or in the lab and can be used for a variety of applications. Using J&W Scientific's propriety sensing technology, the flowmeter automatically switches between positive and negative readings when flow rates exceed 20mL/min.

The ADM3000 provides accurate volumetric flow measurements with any non-corrosive gas. In addition, it is equipped with an RS232 output making the ADM3000 ideal for continuous data logging applications. An AC power adapter is included to provide convenient long-term operation.

Contact:
Douglas Scientific,
P O Box 45 027 Auckland 8.
Outside Auckland phone 0800 735 725,
Phone (09) 837 5447,
Fax (09) 837 5446
Or circle number 54 on the reader reply card

PLASMA 400+ ICP EMISSION SPECTROMETER AND PLASMA 400 WEAR METALS ANALYSER

The Plasma 400+ and Plasma 400 WMA offer affordable, reliable bench-top sequential ICP Emission capability, with optional QC Expert quality assurance software for GLP sample tracking, method implementation and data validation.

In addition to the usual routine ICP applications, the P400+ and P400 WMA are ideally suited to analysis of oils, and wear metal analysis in engine lubricating oil samples.

A free-running 40MHz RF generator with no moving parts whatsoever offers high reliability, and a thermostatted optical system ensures high stability for high-throughput, routine applications. The system is ideally suited for the commercial or service laboratory. A high degree of artificial intelligence manages multiple functions, including selection of background correction points. Real-time spectral display enhances operator convenience. An integral 50,000 line wavelength table assists the analyst in spectral identification and method development. Report generation capabilities are a standard feature of the software, permitting flexible, yet traceable reporting.

The following additional materials are available upon request:-

- P400+ ICP Emission Spectrometer technical package
- A Guide to the Perkin Elmer P400+ and P400WMA
- ICP Analysis of Wear Metals in Lubricating Oils

Contact: Perkin Elmer New Zealand
P.O. Box 22-159,
Otahuhu, Auckland.
Ph. (09) 276 2230 Fax (09) 276 5602.

Or circle number 34 on the reader reply card

THE PIONIR 1024 PROCESS NIR SYSTEM FOR THE PETROLEUM INDUSTRY

A comprehensive information folder available from Perkin Elmer explains how the PIONIR 1024™ Process NIR System provides rapid on-line results for practically all physical and chemical properties normally monitored in refineries.

This includes RON<MON, specific gravities, boiling points, benzene, aromatics, naphthene, isoparaffins, olefins, oxygenates, and others. Pipeline and chemical applications are included.

The system is rugged, reliable in any environment, and field-proven, through Perkin Elmer's collaboration with major global participants.

The system includes a fibre-optic probe that may be separated from the analyser by distances up to one kilometre. Operating temperature range of the system is from -5°C to 50°C, and within Class 1, Division 1, Groups C and D environments.

An integral computer enables full operation without an external PC. A single measurement facilitates determination of properties required to meet local and national environmental regulations, while monitoring multiple additional properties that permit efficient control of the process. Payback is thus very fast.

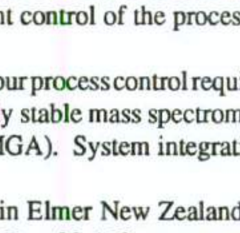
Call us to discuss your process control requirements, including NIR and also highly stable mass spectrometer-based process control systems (MGA). System integration capabilities are available.

Contact: Perkin Elmer New Zealand
P.O. Box 22-159,
Otahuhu, Auckland.
Ph. (09) 276 2230 Fax (09) 276 5602.

Or circle number 32 on the reader reply card

THE NEW METTLER TOLEDO DL SERIES OF TITRATORS

From the convenience and simplicity to run a routine titration with just a few key strokes to the ability to develop your own titration methods for research and development, the new Mettler DL series titrators suit all applications. Certified to ISO 9000 standards, the titrator can automatically control up to four burettes and six sensors.



Measurement and temperature compensation can be carried out manually or automatically and temperature as well as pH can be measured during the titration. Raw and intermediate results can be utilised for calculations during and following the analysis and the instrument carefully documents all calculations.

A printer and balance interface are standard with the three available models:

DL67 - Routine system
DL70ES - General Purpose system
D77 - Multi-tasking system

Optional additional RS232C interfaces for sample changer and computer connection are available.

Contact: Watson Victor Ltd,
P.O. Box 1180, Wellington.
Ph. (04) 385 7699 Fax (04) 384 4651.

Or circle number 35 on the reader reply card

PERKIN ELMER 16PC AUTOMATED FTIR OIL ANALYSIS SYSTEM

The Perkin Elmer 16PC Fully-Automated Oil Analysis System combines the highly reliable Model 16PC Fourier Transform Infrared Spectrometer with the AS-90 Autosampler and a specialised control package based upon the powerful InfraRed Data Manager software (IRDM2) with OBEY programming.

Proven in the New Zealand market, the 16PC represents the top of the range of the successful 1600 Series FTIRs. Complete system control is integrated within the IRDM environment, providing unparalleled performance and convenience. Quantitative sample analysis and reporting may be automated. Throughput may be maximised with absolute confidence, guaranteeing a high return on investment for the commercial laboratory whose focus is customer service and responsiveness.

Another application-specific solution from Perkin Elmer.

Contact: Perkin Elmer New Zealand,
P.O. Box 22-159,
Otahuhu, Auckland.
Ph. (09) 276 2230 Fax (09) 276 5602.

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AURORA SCANNING NEAR-FIELD OPTICAL MICROSCOPE

TopoMetrix Corporation introduces the Aurora™ Scanning Near-Field Optical Microscope (SNOM) - the first commercial microscope to break the diffraction limit barrier to resolution. Aurora offers all of the advantages of optical microscopy plus the extremely high resolution (<50nm) of a scanning probe microscope. With SNOM, you can use optical microscopy at resolutions not possible before.

The diffraction limit that restricts conventional optical microscope resolution is overcome by placing the sample extremely close (a fraction of a wavelength) to a small light aperture. The resolution limit then becomes the size of the aperture, not the wavelength of light. Photons exiting the small aperture remain collimated for about 5nm, then rapidly diverge in the lateral direction. In SNOM, the sample is kept within the collimated region. Apertures can be fabricated repeatably with sizes of <50nm.

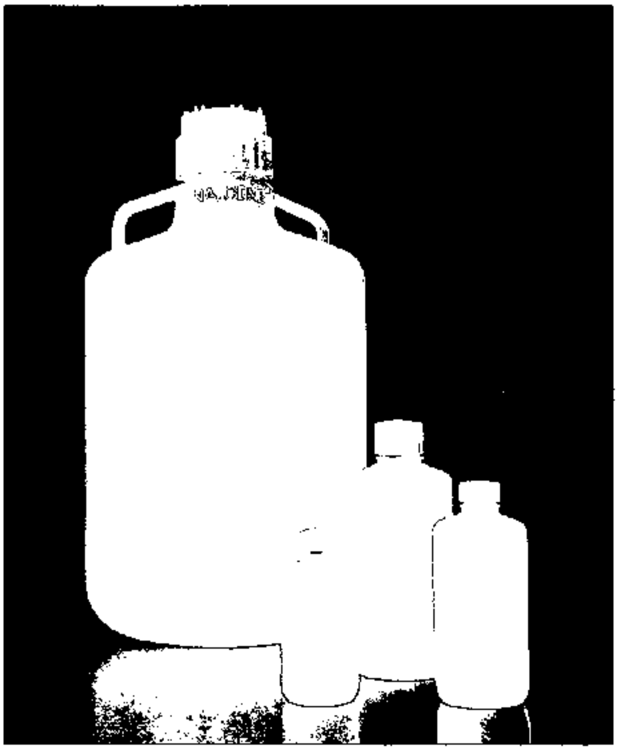
Aurora operates in liquid as well as air, is noninvasive to the sample, and provides an image to which the human eye and mind can directly relate. It is designed for a wide range of applications in research, engineering, and manufacturing. The same contrast mechanisms that are common to conventional (far-field) microscopy can also provide contrast in the near field. Thus, Aurora can be used for high-resolution imaging for any optical microscopy application. These include: biological fluorescence imaging, medical imaging, semiconductor imaging (particularly in the reflection mode), thin film analysis, data storage, optical lithography, polarization-dependence imaging of optoelectronic materials and polymers, and spectroscopy (including fluorescence, luminescence, and emissions experiments).

The photo shows the special SNOM tip in operation. The glow at the end of the fiber optic tip comes from the laser light emitted from the fiber at the sample. Signal collection optics are seen at the bottom.

Contact: TopoMetrix,
5403 Betsy Ross Drive, Santa Clara,
California, U.S.A.
Ph. 1-408-9829700 Fax 1-408-9829751.

Or circle number 57 on the reader reply card

FLUORINATED BOTTLES IDEAL FOR TRANSPORT OF PETRO CHEMICALS



Nalgene fluorinated bottles and carboys have been chemically treated with fluorine gas to increase resistance to selected solvents and are ideal for use when glass or metal containers are not economical or feasible under IMO shipping requirements. Fluorination gives these products a chemical compatibility matched only by Teflon, but at a significantly reduced cost compared with Teflon. This makes these bottles ideal for transporting/shipping products such as oil and other hydrocarbons and also solvents, strong acids and alkalis. All bottles are clearly marked for DOT and ISO standard conformance with the DOT rating, material, volume, year of manufacture and the Nalgene brand name clearly stamped on the bottle. Nalgene has recently expanded the range of fluorinated bottles and carboys by introducing new sizes of narrow and wide mouth bottles.

Contact: Medic Corporation Ltd,
Private Bag, Lower Hutt.
Ph. (04) 569 3539
Fax (04) 569 7984.

Or circle number 58 on the reader reply card

HYDROCARBON ANALYSES OF ENVIRONMENTAL SOIL AND WATER SAMPLES

Dr Max Robertson
GRAYSON LABORATORIES

Chemical analyses of soil and water samples are amongst the most important data acquired during an investigation of any oil industry site. Analytical results determine whether further investigation or remediation are necessary. However there is much confusion concerning which chemical analyses are to be performed and which specific technique or option is the most appropriate for the investigation. The problem is further confused when water discharge rights include specifications for analytical results. Often these specifications are inappropriate for the operations being carried out. Sources of contamination of soils and water discharges, which have traditionally required analysis for "oil and grease" include:

Mineral heavy oils and greases
Light oils
Diesel
Jet A1 and kerosene
Mineral turpentine and intermediate solvents
Petrol, leaded and standard
Petroleum spirits
Industrial solvents
Animal and vegetable fats and oils

Often decision makers set legal requirements and ask for results, for "Oil and Grease" or "Total Petroleum Hydrocarbons" (TPH). *These may not be appropriate!*

Examples of misunderstanding which analysts encounter are:

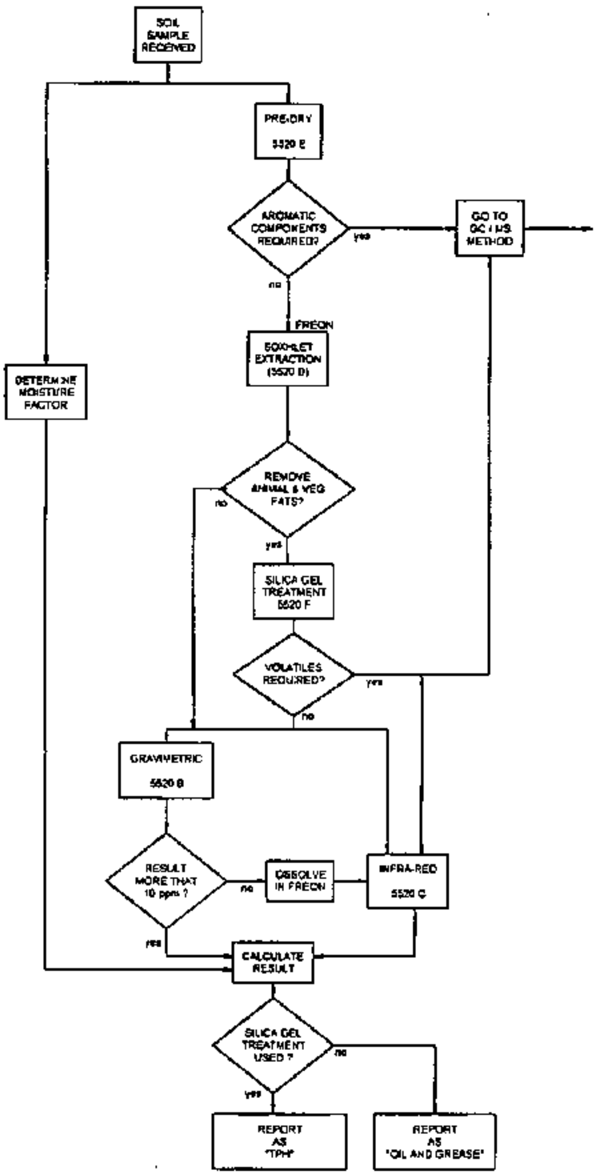
1. Requests for (or results provided from) the gravimetric TPH method when the discharge contains only petrol or diesel. Clearly the evaporation step will cause all petrol and most diesel to be lost.

2. Requests for (or results provided from) the freon extraction / Infra-red finish, TPH method when the main source of contamination is petrol.

The wave number specified in the standard IR methods is for aliphatic compounds. Since petrol is largely aromatic this method will not measure it either. The added complication with future requests for these methods is that soon it will be impossible to obtain freon.

3. Request for benzene, toluene, ethyl benzene and xylene (BTEX) when there has been no trace of petrol or other sources of volatile aromatics at the site.

OIL AND GREASE IN ENVIRONMENTAL SOILS



4. Request for EPA methods with very low limits of detection during a contaminated site remediation programme, when a screening procedure on most samples plus trace level analyses on selected ones would provide the required information more cost effectively.

The following discussion lists the range of tests available to determine the components discharged or the extent of the contamination, and attempts to match the likely contaminants with the most relevant test.

Legislators setting limits for soils, ground-waters or discharges must be careful that the analyte requested is relevant to the industry being investigated. If the more traditional TPH type test is specified, then the TPH option must also be specified (see attached flow charts).

TEST OPTIONS AVAILABLE FOR HYDROCARBON ANALYSIS

1. Oil and Grease and Total Petroleum Hydrocarbons APHA 5520.
   Flow-charts are presented to illustrate the various options available to the analyst when the request or specification is for TPH or Oil & Grease. Each option will give a different answer for most environmental samples. The information user must therefore clearly understand what they want and what the laboratory is going to give them. This method is not appropriate for volatile fuels.

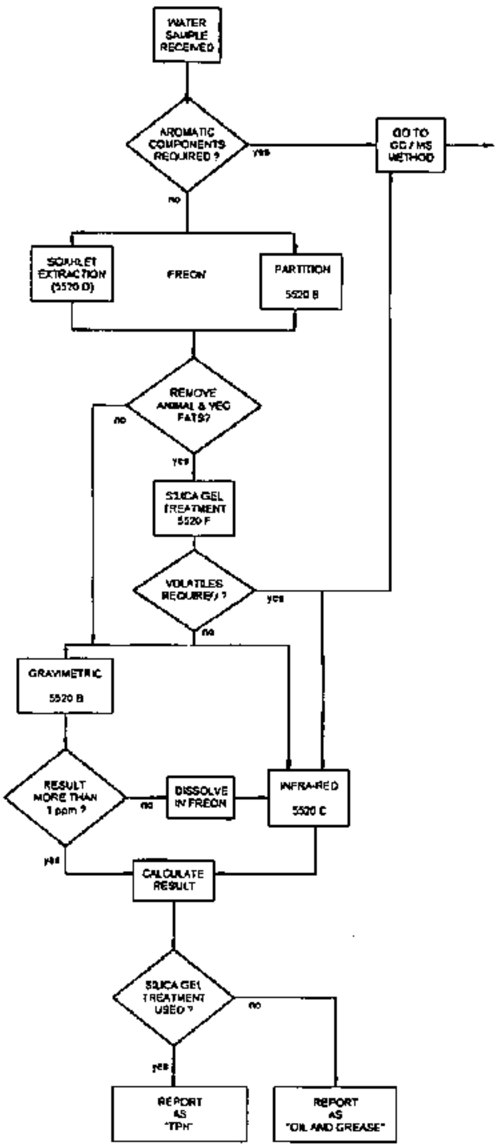
2. Volatile Organics EPA 8240.
   This method involves Purge and Trap concentration / capillary GC/MS. It is appropriate for industrial solvents, petrol, and petroleum spirits. It is not suitable for solvents which boil above the kerosene range. It is a particularly sensitive method and is advised where "Dutch B" criteria of, for example BTEX, are required in soils or waters.

3. Semi-volatile Organics EPA 8270.
   This method involves a concentration by evaporation step following sonication / solvent extraction. Final analysis is by capillary GC/MS. It is suitable for solvents boiling from above the kerosene range to the "priority" PAH's, although it is not sensitive enough for the "Dutch B" PAH criteria. Significant petrol, if present, is lost in the concentration step of this method.

4. Polycyclic Aromatic Hydrocarbons (PAH)EPA 8270 Modified for selective ion monitoring
   For the more sensitive results required for "Dutch B" levels of PAH's on some samples, a special run of capillary GC/MS involves selected ion monitoring for the actual PAH's which are required. These carcinogenic PAH's are particularly abundant at old gas-works sites.

5. Petroleum fuels screen
   In-house screening method based on EPA 8270.
   For site investigation work involving fuel storage sites, or accidental spill sites, Grayson Laboratories have developed a screening method designed to indicate the presence and establish the identity of the various hydrocarbon fuels. The method involves sonication / solvent extraction followed, without concentration, by direct capillary GC/MS.

OIL AND GREASE IN ENVIRONMENTAL WATERS



Thus, compounds can be detected from benzene through to the priority PAH's (little petrol is lost as there is no concentration step). The specific solvents present from petrol to diesel can often be identified with good profiles to help with trace-back identification work.

However, detection limits are not as good as with the above specific tests and fall significantly short of Dutch B requirements.

RACI 75TH ANNIVERSARY LECTURE

PRESENTED IN SEPTEMBER 1992

Scientists as Citizens

Sir John Warcup Cornforth, AC, CBE, FRS
School of Chemistry and Molecular Sciences, University of Sussex at Brighton, East Sussex BN1 9QJ, United Kingdom

The following is the 2nd part of the above lecture. The first part appeared in Chemistry in New Zealand Volume 57 No.3 July 1993 on pages 25 to 29.

The dilemma of truth

The last dilemma I call the dilemma of truth. In England, I live on a hill opposite the old and historic town of Lewes. There is an obelisk on that hillside; I pass it nearly every day. It bears an inscription beginning:

In loving memory
Of the undernamed seventeen Protestant martyrs
Who for their faithful testimony to
GOD'S TRUTH
Were during the reign of Queen Mary
BURNED TO DEATH
In front of the Star Inn, now the Town Hall, Lewes.

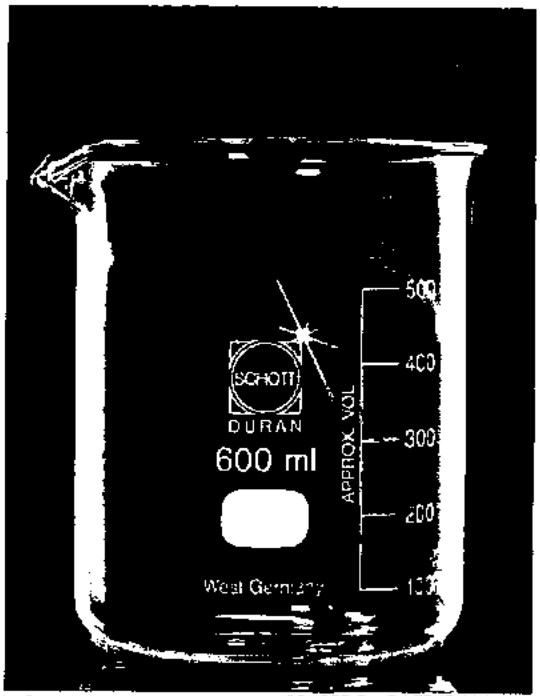
There are several deep ironies engraved on that stone. First, the people who burned these unfortunates were equally obstinate in their belief that they were defending God's truth against dangerous heresy. Secondly, this monument was erected, 350 years after the event, with the purpose of keeping sectarian division alive; and even now, nearly a century further on, people of the same two sects are killing each other in Northern Ireland. But perhaps the supreme irony is that although there are several hundred religions now, and there have been many more, each of them claims to be true and exacts belief from its members, and most unfortunately, their children. Certainly, there is a widespread fear of personal death and if you offer eternal life in exchange for eternal credulity - as most religions do - you will find many takers. But the side effect, the belief beyond reason is regarded as virtuous, has been very damaging to the human species; and, as ever, most of the harm is done by the people who are most convinced that they are right.

The discipline of science generates a special relationship with truth. There is what I will call public truth: the obligation to record what you have done as accurately as you can, never fabricating, never distorting, and never suppressing findings unfavourable to your conclusions. Private truth is even more important. As a scientist interacting with your experiments, you receive an education in the implacability of truth and in your own capacity to be deceived by your expectations, your hopes, or just your stupidity, that is unlike any other experience I know. And you may find the worst deceit in what religious people might call inspiration or revelation. We all know the euphoria that comes from suddenly seeing some thing in a new light, and the more elements that seem to take part in the new pattern, the stronger the feeling. But as every scientist finds out, the feeling is not less strong for mistaken visions than for those that will survive a cold examination. You must lean over backwards, as Feynman put it, to resist belief. All this is very different from the attitude in other professions. For a politician, truth is something to hide and twist, and to tell only when it is entirely favourable. For the media, truth is of secondary importance except sometimes as a defence to an action for libel or slander. For advertising people, truth is like a pinch of baking powder in a muffin - it puffs up a mass of misdirection into something that the public will swallow. For lawyers, decisions have to be reached on incomplete and at times artificially restricted data. The legal profession insists on making witnesses swear an impossible oath about the truth, but its members do not take that oath, and its judges are less interested in the discovery of truth than in the observation of legal form.

The faults of science

I don't wish to leave you with the impression that I think of scientists as latter-day saints, so I had better get on to their weaknesses: not the human weaknesses, though scientists have their full share of those, but the failings that stem from their own practices and even from their own success. One of the chronic weaknesses arises from their own experimental method. When scientist study a problem experimentally they invariably begin by simplifying it, trying to remove disturbing influences that make observations, especially measurements, more difficult. It is a powerful technique and our present information about the physical and biological world has been built up by applying it. The trouble begins when you start integrating the results into more complex situations - and practically every situation to with life is extremely complex.

A good example, one of many, is provided by the insecticide DDT. Its high insect-killing power and low human toxicity were discovered around 50 years ago. It is easy and cheap to make in bulk. Its first major success was to stop a typhus epidemic in its tracks - something that had never been done


SCHOTT
DURAN
600 ml
APPROX. VOL
500
400
300
200
100
West Germany

before. Its use against malaria-carrying mosquitoes has probably saved several million human lives.

But it was indiscriminate and persistent, and it worked its way up food chains until it did definite harm to some predators and was detectable in the fat of practically every human being. Detectable, mind you, only by methods that scientist developed for the purpose: the actual quantities were tiny. It taught chemists a lesson that they learned well - not to let biologically persistent molecules loose in large quantity. But if there is a wider lesson to be learned, perhaps it is that all new discoveries have to be introduced gradually and with circumspection. If that lesson had been heeded, the parallel fiasco of power fro nuclear fission might have been avoided, and our species might now be enjoying a safe, judicious and unfeared expansion of this useful source of energy. I think we should all hope that, when fusion power comes, we shall act more wisely. As it is, people have the feeling that scientists are not wise enough always to know when they are doing harm; and the people are right.

The tendency to oversimplify is linked with another weakness: scientists are apt to overvalue the importance of new discoveries, and to underrate the extent of their own ignorance. Many pressures reinforce this tendency. The status of scientists is strongly influenced by public as well as peer assessment of their work's importance; and when scientists are debating matters of public interest they are sometimes led into arrogance by the fact that their evidence does, usually, stand up to closer scrutiny than that of their adversaries. In short: as citizens they cannot afford to be humble, but as scientists they must be. Society makes it hard for them to see that the public trust that they need as a profession must come from refusal as individuals to go beyond the fact.

The third weakness is of more recent growth and it stems from the success of science. The information that sustained earlier civilisations could be handed down from parent to child, from master to apprentice; and while each craft was within the compass of one brain, the only thing that could break the chain was extinction of the culture, as sometimes did happen. Now, we have an enormous and growing mass of information, much of is tested. This information is immensely valuable: it comprises in fact our inheritable wealth, and there is far too much of it to be stored in human brains, even if brains were reliable storehouses. It exists as records of what has been done, and it is the basis for further advance. One might have expected that scientists would have understood the absolute need for fast access to *all* this information by *all* scientists. The techniques to do this, based on discoveries made and technologies developed during the past half century are already available. Unfortunately, a concerted effort is required and that effort has not been made. As a result, scientists of different disciplines are understanding each other less and less, the search for information outside their own speciality becomes more and more laborious, and cross-fertilisation of ideas becomes rarer. It will be hard to persuade society to give scientists the additional resources needed to get existing information properly organised and instantly available; it would be even more painful to allocate a greater share of present resources for that purpose, at the expense of research. But lasting benefits to science and to society would follow as day follows night.

The strength of science

I have tried in this lecture to show the man interactions and conflicts between scientists and the communities which have produced them. Many things are wrong with this relationship, most of them because scientists are a small minority whom the majority cannot understand. In our adversarial society, they must put their case in a court where there is not judge, no jury, and no rules of evidence; and where their regard for the truth is often a hindrance. Because they have an enormous amount of useful but difficult knowledge that does work very well indeed, their constant temptation is to become a priesthood, wrapped in mystery and competing for belief. Their true strength is to seek something quite different. I cannot put it better than Shaw did in his nearly forgotten play *Back to Methuselah;*

But my ways did not work; and theirs did; and they were able to tell me why. That is their only power over me; they seek no other power.

Scientists need to try harder to show that true strength, which essentially is that they thrive on being doubted. In this, they differ from all others among the shapers of society. I should like to see a different emphasis put on the teaching of science, and emphasis that would reflect the truth that the sciences are different from nearly all other subjects taught. Languages, literature, religion, law, art, music, even pure mathematics are all human constrictions, and they can be taught on the basis that "these things are so because men made them so". But the sciences deal with the natural world, which men did not make at all; and the honest way to teach them is "these things are probably so because of this, and this, and this". The student will become a scientist all the faster by doubting the teacher and looking at the evidence: no lesson is learned so well as the one you teach yourself. And for students who will not become scientists, the habit of asking questions like "Who says so?" How do they know? What's missing? What are the assumptions? What is the scale? Is it all about the same thing? Do the figures make sense?" will make them more receptive to the message of science for the rest of their lives. To be sure, the propagation of that attitude will cause a lot of grief among politicians, priests, mediamen, advertisers, barristers, diplomats and other salesmen of all kinds, who can be relied on to oppose these educational reforms. But in the end, scientists have some influence on how science is taught; and they have in the schools the opportunity to start the sceptical revolution. Our species does desperately need to review critically its position and prospects, and to understand that this review has only become possible in spite of, not because of, our habits of opposing, oppressing and killing each other.

* * * * * *

Conferences and Seminars

7-10 December, 1993. **NZIC Conference**
Venue: University of Auckland,
Auckland, New Zealand.

> Readers are reminded that abstracts of papers (oral presentations and posters) are to be submitted to the Conference Secretary by 30 September, following the guidelines given in the July issue of the Journal.
>
> Intending registrants should also note that the registration form printed on p45 of the July issue does not specify the cost of the conference dinner and the Vineyard Tour. The cost for each event is $40.00, and prepayment is requested.
>
> The Conference Committee has decided to offer reduced registration fees for retired NZIC members. Registration fees for those members will be 25% less than the fees listed on the registration form (except for the special registration fee for the Chemical Education Symposium, for which there is no reduction).
> N.B. Receipts will not be issued until November unless specifically requested.

Enquiries about the conference should be directed to:
The Conference Secretary, Dr. Alan Easteal,
Chemistry Department,
University of Auckland,
Private Bag 92019, Auckland.
Ph. (09) 373 7599 ext 8963 or 8343
Fax (09) 373 7422
e.mail: aj.easteal@auckland.ac.nz

26 September-1 October, 1993. **12th Australian Symposium on Analytical Chemistry (12AC) incorporating the 3rd Environmental Chemistry Conference (3EL).**
Venue: Burswood Convention Centre, Perth,
Western Australia.
For further information contact:
Conference Secretariat,
12AC/3EC,
UWA Extension,
Conference and Seminar Management,
The University of Western Australia, Nedlands,
Western Australia 6009.
Ph. 61-9-3803181
Fax 61-9-3801088.

11-15 October, 1993. **VIth International Conference on Superoxide and Superoxide Dismutase.**
Venue: Kyoto, Japan.
For further information contact:
JTB Communications Inc.,
New Kyoto Centre Building 5F,
Shiokoji - Shinmachi, Shimogyo-ku,
Kyoto 600, JAPAN.

17-22 October, 1993. **Twentieth Annual Meeting of the Federation of Analytical Chemistry and Spectroscopy Societies.**
Venue: Cobo Hall, Detroit, Michigan, USA.
For further information contact:
FACSS National Office,
198 Thomas Johnson Drive S-2,
Frederick MD 21702, USA.
Ph. 1-301-8464789
Fax 1-301-6946860

20-22 October, 1993. **5th NZ Coal Conference.**
Venue: Park Royal Hotel, Wellington, New Zealand.
For further information contact:
The Conference Secretary,
5th NZ Coal Conference,
Coal Research Association NZ Inc,
P.O. Box 31-244,
Lower Hutt, New Zealand.
Ph. 64-4-5662289
Fax 64-4-5667737.

4-5 November, 1993. **Journal of Organometallic Chemistry Conference on Applied Organometallic Chemistry.**
Venue: Technische University,
Munchen, Germany.
For further information contact:
COMST,
P.O. Box 415,
1101 Lausanne, Switzerland.

5-8 December, 1993. **RACI - Organometallic Meeting**
Venue: University of New England, Armidale,
New South Wales, Australia.
For further information contact:
Dr. Mark Humphrey,
Department of Chemistry,
University of New England,
Armidale, N.S.W. 2351, Australia.
Ph. 61-67-732 872
Fax 61-67-711 563

6-10 December, 1993. **Australian Conference on Optics, Lasers and Spectroscopy.**
Venue: University of Melbourne, Melbourne,
Australia.
For further information contact:
Dr. R. J. McLean,
ACOLS '93 Conference Secretary,
CSIRO Materials Science and Technology,
Locked Bag 33,
CLAYTON,
Victoria 3168, Australia.
Ph. 64-3-5422875
Fax 64-3-5441128.

10-12 December, 1993. **17th National Meeting of the Australian Society for Biophysics (ASB-93)**
Venue: ANU, Canberra
Australia
For further information contact:
Dr Ron Pace,
Department of Chemistry,
ANU
Fax. 61-6-249 0760

13-15 December, 1993. **Inorganic Reaction Mechanisms Meeting 93**
Venue: Wilhelm-Kempf Congress Centre,
Wiesbaden-Naurod,
Germany
For further information contact:
Professor Horst Elias,
Anorganische Chemie III,
Technische Hochschule Darmstadt,
D64289 Darmstadt,
Germany
Ph. 49-6151-162425
Fax. 49-6151-164073

13-17 December, 1993. **3rd Pacific Polymer Conference**
Venue: Gold Coast, Australia.
For further information contact:
PPC-3 Secretariat,
Department of Chemistry,
University of Queensland,
Queensland 4072, Australia.
Ph. 61-7-3653511
Fax 61-7-3653628.

10-21 January, 1994. **The 27th General Assembly of the International Association of Seismology and Physics of the Earth's Interior (IASPEI 94)**
Venue: Victoria University, Wellington, New Zealand.
For further information contact:
The Secretary, IASPEI 94,
Institute of Geological & Nuclear Sciences,
P.O. Box 1320,
Wellington, New Zealand.
Ph. 64-4-4738208
Fax 64-4-4710977.

3-4 February, 1994. **NZIC Chromatography Group "Supercritical Fluid Extraction, Solid Phase Extraction and other Advances in Chromatographic Analysis"**
Venue: Rotorua, New Zealand.
For further information contact:
Dr. Peter Robinson,
R. J. Hill Laboratories Ltd,
P.O. Box 4048,
Hamilton East, New Zealand.
Ph. 64-7-8552266
Fax 64-7-8549886

8-9 February, 1994. **Second New Zealand Symposium on Biosensors and Chemical Sensors.**
Venue: Bishop Julius Hall,
University of Canterbury, Christchurch, NZ
For further information contact:
Wendy Collier,
AgResearch Grasslands,
Private Bag,
Palmerston North, New Zealand.
Ph. 64-6-3568019
Fax 64-6-3561130.

13-18 February, 1994. **8th International Conference on Surface and Colloid Science.**
Venue: Adelaide Convention Centre,
Adelaide, South Australia.
For further information contact:
The Secretariat,
Techsearch Incorporated,
GPO Box 2471,
Adelaide,
South Australia 5001.
Ph. 61-8-2671755
Fax 61-8-2674031.

20-22 February, 1994. **Australian Chemical Industry Council (ACIC) Convention 1994**
Venue: Fairmont Resort,
Lewa, Blue Mountains,
NSW, Australia

28 April - 1 May, 1994. **4th Joint Conference of the Australian and New Zealand Societies of Cosmetic Chemists**
Venue: Conrad Jupiters Hotel,
Gold Coast, Australia
For further information contact:
Grant Binney,
Unit Pack Pty Limited,
P O Box 423,
Mt Ommoney,
Queensland 4074,
Australia
Ph. 61-7-376 6700
Fax. 61-7-376 6532

3-8 July, 1994. **RACI Division of Organic Chemistry 14th National Conference**
Venue: University of Wollongong,
Wollongong, Australia
For further information contact:
Professor John Brenner (Chairman),
University of Wollongong,
Department of Chemistry,
Locked Bag 8844,
South Coast Mail Centre,
NSW 2521, Australia
Ph. 61-42-214 255
Fax. 61-42-214 287

24-29 July, 1994. **30th International Conference on Co-ordination Chemistry.**
Venue: Kyoto International Conference Hall,
Kyoto, Japan.
For further information contact:
Professor Koji Taraka,
Secretary of XXX ICCC,
Coordination Chemistry Laboratories,
Institute of Molecular Science,
Myodaiji, Okazaki, 444 Japan.
Ph. 81-564-55-7252
Fax. 81-564-54-2254

1-4 August, 1994. **9th International Drying Symposium (IDS '94)**
Venue: Gold Coast, Australia
The NZIC is co-sponsoring this conference and further information can be obtained from:
Alan Turner,
General Secretary/Executive Officer NZIC,
P O Box 12 347,
Wellington
Ph. 04-473 9444
Fax. 04-473 2324

17-22 December, 1995. **Pacific Chem '95.**
Venue: Honolulu, Hawaii, U.S.A.

Were you there in '89? If you did not attend Pacifichem '89 in Honolulu then you should start planning now for the 1995 meeting, because you won't get another chance until 2000! If you *were* there then you'll need little encouragement to return in 1995.

Pacifichem, the International Congress of Pacific Basic Chemical Societies, 17-22 December 1995, provides the only forum for Pacific Basin chemists and biochemists to meet centrally, exchange information and assess the state of their discipline. The Congress opens on Sunday 17 December, the scientific session runs until lunch time on Friday 22 December, and you can get home for Christmas if you wish!

The Congress will operate with something in excess of 400 different half-day sessions grouped into some 130 symposium topics ranging through all major modern aspects of chemistry and much biochemistry. For those interested, the Branch Secretaries and the Victoria University Chemistry and Biochemistry Departments have a list of these. Planning is now well under way and some 48 meeting rooms and accommodations in the Sheraton and Hilton properties on Waikiki beach have been booked. From the symposia already proposed some 25 NZIC members appear to be involved even at this early stage. The presentation of work will be by both invitation and submission. In addition to the many specialised symposia, general sessions will be held in each of the ten broad subject areas.

Sponsorship to the Congress of 30 'Young Scholars' from the emerging nations of the Pacific Basin has been agreed to. If you know of anyone in South America, South East Asia etc, likely to be interested please have them contact:
The Pacifichem Office
American Chemical Society,
1155 16th Street,
NW, Washington DC 20036, USA.

For New Zealand PhD student members (Chemistry and Biochemistry), we now advise that one among you will receive sponsorship from the Ministry of Science and Technology and the NZIC to present a poster for the Student Poster Presentation Award of Merit (the actual presentation will be within the selected congress symposium). Details for application/selection will be available from the NZIC Office and Heads of Departments early in 1994.
Deadlines:
Abstracts for contributed/invited papers: 31 March 1995.
Registration: $US 275.00 by 1 November 1995.

NZIC NEWS

COUNCIL ELECTIONS

As from 1st September 1993, the following are the elected members of Council:

President	Professor Arthur Williamson
1st Vice President	Professor Bill Denny
2nd Vice President	Mr Nath Pritchard
Honorary Treasurer	Mr Dennis Karl
Hon. General Secretary	Mr Alan Turner

The balance of Council comprises the delegates appointed by Branches. Currently these are:

Dr Jim Metson	Auckland Branch
Mr Nath Pritchard	Waikato Branch
Dr John Shaw	Manawatu Branch
Dr Keith Morgan	Wellington Branch
Dr Jan Gregor	Canterbury Branch
Dr Mel Carr	Otago Branch

President A. G. Williamson, Emeritus Professor

We include some brief biographical details on the incoming President, Arthur Williamson

Trained as a physical chemist at Canterbury University, University of Reading and UCLA, specialising in Thermodynamics of solutions.

Taught at Otago University for 7 years 1959-66.

Transferred to Canterbury in University 1967 and developed an interest in Industrial Energy Conservation and Solar Energy.

Retired from University in 1989 and now manages a small company specialising in energy products and energy research. His concerns for chemistry - as a profession - are to support and encourage enthusiasm for the subject at school level and to promote communications among practitioners of chemistry working in the objective (rather than discipline) oriented environment of the CRI's. Another aim is to re-establish some of the close relationships that used to exist between chemists and chemical engineers, particularly with regard to the importance of their collaboration in tackling the energy/environmental problems which have now become more than urgent.

ANNUAL GENERAL MEETING

Notice is given that the AGM will be held on Monday, 6 December, 1993, at 5p.m. in O'Rorke Hall, University of Auckland. This is immediately prior to the social mixer to the start of the 1993 Conference.

A. A. Turner Honorary General Secretary

CHEM 13 NEWS

Subscriptions are currently being renewed for this chemical education magazine produced by the Chemistry Dept. of the University of Waterloo, Ontario, Canada. The rate for the 93/94 year is $30 - if you would like to receive a complementary copy for inspection please contact:

The Secretariat
P.O. Box 12-347,
Wellington.

A. A. Turner Honorary General Secretary

TREASURER'S REPORT

The 1992/93 NZIC accounts have been audited and are presented here.

In my report for the 1991/92 financial year I expressed my concerns as to the financial state of the Institute. To some extent the predictions made have eventuated. The net expenditure over income for the year shows a deficit of $20,452.00 The deficit was financed by use of funds available in the reserve accounts. The balance sheet shows a drop in the net assets of the Institute equivalent to the above figure. This is slightly less than predicted but is still unsustainable even in the short term. The effects of your Council's action on this problem should be evident in the 1993/94 Statement of Accounts.

Total income shows a slight overall drop. The effect of no conference surplus can clearly be seen. The apparent increase in subscriptions from members is a one-off effect of a vigorous policy of forgiving long outstanding subscription arrears upon the condition that such members paid the current and immediately preceding year's subscription. This met with a positive response from a number of relapsed members. The regaining of this income should offset the overall decline in income from subscriptions. Interest income continues to decline sharply, reflecting both the drop in interest rates available, and also the drop in reserves available as a result of financing the deficit. We have received a further repayment of capital from Equiticorp. The receivers have indicated that further recoveries are unlikely to be significant. The money in the Chemical Olympiad account represents reserves at the balance date only and were used in the next financial year.

Expenditure showed some increase over the previous year. Again the two major items were the journal and secretariat. While the secretariat costs are controllable and stable, Council were extremely concerned about the lack of control over the steadily rising publishing costs of the journal. This, together with the lack of action by the publisher in making attempts to contain these costs, saw Council establish a subcommittee with a mandate to correct the problem. As a result of their actions the journal is now published under a different set of conditions and with a new publishing house. These changes will have a positive effect on the income/expense account such that a small surplus of income over expenditure is budgeted for in the 1993/94 accounting year, provided other expenditure patterns remain constant.

While this is a very satisfactory outcome it still leaves the Institute vulnerable to other expense increases but, more importantly, it leaves little room for Council to increase services to members. There has been no increase in the level of subscriptions for several years. If members want the increase in services they claim to want, then some consideration must be given for modest increases in the subscription rate in the near future.

The next AGM of the Institute will coincide with the next Council Meeting and Conference in December 1993. It is up to you as members to make your submissions on this, and any other matters, to Council through your Branch Delegate or by attendance at the AGM.

ANNUAL REPORT

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 30TH APRIL 1993

INCOME			1993	1992
Subscriptions from Members			105,875	98,628
Sundry Income			(872)	321
Conference Surplus			1,685	11,042
Chem 13 Exam fees			3,900	2,151
Chem Education Subscriptions			320	569
IUPAC			633	555
Chem 13 News			690	2,505
Interest - BNZ			3,232	6,451
Interest - Local Body Stock			31	161
Equiticorp Capital Repayment			3,442	161
			118,936	122,414
Chemical Olympiad Donations	27,522			5,195
Chemical Olympiad Expenses	19,132			5,195
			8,390	
			127,326	122,414
EXPENDITURE				
Accountancy and Audit fees		2,376		2,687
Accommodation Expenses		3,629		4,288
Branch Expenses - Capitation Fees		10,764		10,764
Branch Expenses - Student Travel		3,500		3,500
Chem NZ Expenses		3,123		3,927
Chem 13 Expenses		1,994		2,142
Conference Registrations		3,305		378
Conference Expenses		582		505
Donation		805		-
Depreciation		48		60
Goods and Services Tax		(1,794)		(5,412)
Interest and Bank Charges		540		1,248
Journal - Publisher		44,785		43,655
Journal - Editor		3,057		3,600
Sundry Publications for Resale		854		1,029
Overseas Visitors Expenses		747		450
Printing, Stationery and Postage		7,510		8,059
Prizes		1,600		900
Rent to IPENZ		2,565		2,565
Secretarial Services		42,288		42,600
Secretarial Set-up Costs		3,053		2,363
Subscriptions		1,717		3,460
Telephone and Fax charges		1,956		935
Travelling Expenses		8,774		8,236
			147,778	141,939
NET EXPENDITURE OVER INCOME			20,452	19,525

CAPITAL FUNDS				1993	1992
Balance at the beginning of the year				27,194	46,737
Less Net Expenditure over Income				20,452	19,543
Development Fund				46,699	46,699
Easterfield Account				567	567
				54,008	74,460
REPRESENTED BY:					
CURRENT ASSETS					
Accounts Receivable			6,241		4,589
Prepaid Travel Account			1,471		986
Subscriptions in Arrears			2,000		3,289
8th Australian Electrochemistry Conference			-		2,233
BNZ Current Account			1,238		2,272
BNZ Autocall Account			9,957		64,453
BNZ Term Deposit Account			33,002		-
Interest PAYE			-		141
Stock of Ties and Scarves on hand			2,000		3,000
				55,909	80,963
FIXED ASSETS					
Office Equipment	582				582
Less Accumulated Depreciation	392				344
			190		238
Presidential Chain			360		360
		550	598		
INVESTMENTS					
Equiticorp $21,000 Debenture			1		1
Lyttleton H.B. Stk 6.25% 1998			500		500
		501	501		
TOTAL ASSETS			56,960		82,062
CURRENT LIABILITIES					
Accounts Payable	2,452				2,832
Subscriptions in Advance	500				1,150
Chemical Olympiad Donations in Advance	-				3,620
				2,952	7,602
NET ASSETS				54,008	74,460

These accounts should be read in conjunction with the attached notes.

NOTES TO THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30TH APRIL 1993

STATEMENT OF ACCOUNTING POLICIES

1. GENERAL ACCOUNTING PRINCIPLES

The general accounting principles recognised as appropriate for the measurement and reporting of earnings and financial position on an historical cost basis have been followed by the business.

Accrual accounting is used to match revenue and expenses.

Reliance is placed on the fact that the business is a going concern.

2. PARTICULAR ACCOUNTING POLICIES

The following particular accounting policies which materially affect the measurement of earnings and the financial position have been applied:

> Accounts receivable are stated at their estimated net realisable value.
>
> Inventories have been stated at the lower of cost or net realisable value on a FIFO basis.
>
> Fixed assets are stated at cost less aggregate depreciation. Depreciation has been calculated using the maximum rates permitted by the Commissioner of Inland Revenue and these are considered appropriate.

The rates used are as follows:

Office Equipment	20% DV

These accounts have been prepared on a GST inclusive basis.

Investments are stated at cost or, where applicable, with the addition of interest compounded to date.

3. CHANGES IN ACCOUNTING POLICY

The accounting policies have not changed since last year.

* * * * * *

AUDITOR'S REPORT

TO THE MEMBERS OF THE NEW ZEALAND INSTITUTE OF CHEMISTRY (INC)

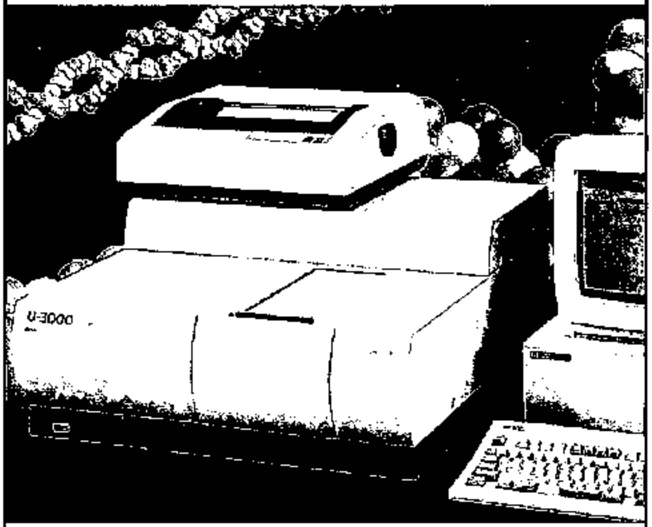
We have audited the attached Financial Statements in accordance with accepted auditing standards and have carried out such procedures as we considered necessary.

In common with other organisations of a similar nature, control over income prior to its being recorded is limited, and there are no practical audit procedures to determine the effect of this limited control.

We have not sighted membership or subscription records and have received the Treasurer's certificate regarding subscriptions in arrears and advance.

Subject to the possible effect of the limited control over income referred to in the preceding paragraph, in our opinion the Financial Statements give, using the historical cost method, a true and fair view of the financial position of the Institute as at 30th April 1993 and the results of its activities for the year ended on that date.

August 1993
Markham and Partners
Chartered Accounts
Auckland



NZIC BRANCH NEWS

AUCKLAND BRANCH

The University has been particularly busy over the past two months with a number of visitors to the Chemistry Department.

Professor Chris Reed from the University of Southern California gave a number of interesting talks, including one which highlighted his interest in fullerences and the related compounds "bucky onions" and "bucky tubes". With Chris's assistance small amounts of C_{60} and C_{70} were prepared in the Department.

This year's industrial visitor to the Department was Des Scott, Managing Director of Tru-Test Corporation Limited. Des, a former Auckland student, gave a talk entitled "Research Management - What is it?"

* * * * *

Warren Roper is hosted Professor Phil Power from the University of California at Davis. Penny Brothers has been working with Phil at Davis during her sabbatical leave this year.

* * * * *

The Auckland Branch was pleased to be able to support the three Auckland students who were selected for the N.Z. team which attended the International Chemistry Olympiad in Perugia, Italy. Two students were selected from Auckland Grammar School and one from Selwyn College.

* * * * *

We were also treated to an entertaining Branch Chairman's address by Michael Taylor, entitled, "Applied and Social Aspects of Chemistry". Michael included many anecdotes from his own career in chemistry, while highlighting interesting aspects of the New Zealand chemical industry.

Helen Palmer, Branch Editor.

MANAWATU BRANCH

On July 2 the Dead Chemists Society met for our inaugural dinner meeting. We were graced by the presence of Cardinal Priestly (Stan White) - obviously promoted since his death. Amongst those present were Pharaoh Scence (Brian Anderson), Seibold (Eric Ainscough), and Michael Faraday (Gavin Hedgwick).

Following dinner we split into teams for an historical chemistry trivia quiz. Von Leibig team lead by the Braggs (Gill and Robert Norris) won ahead of Dalton, Mendele'ev, and Davy teams. Stan Winter and Gill Norris then participated in a spirited discussion on the future and role of the NZIC. A number of issues were raised, including the objectives of the NZIC, the quality and relevance of the journal, the limited membership rules. Stan felt that the NZIC currently spotlights two areas; chemical education and gaining recognition as the voice of chemists with politicians, and that the NZIC was successful in these areas. He emphasised that the success of the NZIC rests on members enthusiasm and he needs to hear your opinions.

Stan then presented an abbreviated version of his talk "Black Cows, Green Grass, White Milk and other problems for the consulting chemist". I didn't hear much about cows but the consulting chemist is very adept at addressing problems at the vineyard!

* * * * *

On July 28, Murray Nicholls of Cosmetic Manufacturers Ltd delivered a talk entitled, "Up ya nose" with the subtitle, "Suffixes in the english language". After exploring various -isms, such as masochism, pessimism, and sesquipedalism; we covered the -ones, such as telephones, ketones and civetone. He recommends a mixture of 96 parts acetone to 4 parts castor oil as the best nail varnish remover ever.

Smell is the least understood sense and the most important component of flavour. The olfactory nerves are connected directly to the limbic centre and the sense is closely tied to the shape of molecules. Recent work has shown that D and L optical isomers have completely different odours. Women are better than men at scent discrimination but we are all poor at strength estimation; in fact, our sensitivity to the intensity of odours halves every 22 years.

Murray then described the growth of the perfume industry resulting from the growth synthetic chemistry in the 1920s, 80% of the 5000 common perfume ingredients are synthetic. To conclude the meeting he presented "family trees" of male and female perfumes, an invaluable aid to those of us who forget anniversaries! Thank you Murray for an entertaining and memorable presentation.

* * * * *

I was sad to receive from Ted Fletcher a report of the death of Godrey Husheer, manager of Scientific Service Laboratories of Napier. Godfrey's black beret and cravat distinguished him as one of the Institute's more colourful members. He was a champion for the cause of non-graduate members of the NZIC and his cheerful, outspoken manner was guaranteed to make others stop and reconsider their entrenched ideas. Members of the branch who visited Godfrey's laboratory some years ago will no doubt remember the badly corroded concrete floors (and cat!) and his stories of exploding 200L Quick-fit flasks. The theoretical chemistry of a research establishment and Godfrey's practical chemistry were light years apart. However they did find common ground at Vidal's wine bar during the dinner that followed the visit. With his passing, the Institute, and the world, has lost some of that intangible quality that lifts life above mere existence and gives it an imaginative face.

* * * * *

At our August meeting Ben Salinger, Professor of Natural Chemistry at Australian National University will speak to us about "Committing chemistry in public" He described his experiences on numerous public bodies such as the National Registration Authority for agricultural and veterinary chemicals and the Independent Panel on Industrial Waste. An interesting talk from which the important conclusion was that chemists must involve the public in order to solve two simultaneous problems - what is socially acceptable and what is technologically feasible.

* * * * *

In June 655 students from 17 schools around our region competed in the annual Chemistry Quiz. A large turnout from the Hawkes Bay and Wanganui areas were lead by Wanganui Collegiate School who won the prize for best overall performance and participation. Josh Boardman of Wanganui Collegiate had the highest mark of the Senior Quiz. Chantell Corbet, Central Hawkes Bay College and Jochen Fitzherbert, Wanganui Collegiate share top honours in the Junior Quiz.

* * * * *

Finally, if you have any news of chemistry events in your area please give me a call.

Grant Boston Ph (06) 350 4649 Fax (06) 356 1476
Email Boston@nzdri.org.nz

OTAGO BRANCH

A group of about 20 members and friends enjoyed a field trip to eastern Southland in May.

On the Friday afternoon a conducted tour through the Mataura Paper Mill gave everyone a close view of the paper-making process in a factory which obtains most of its energy requirements from the water of the Mataura River (hydro-electric generation) and the lignite of the Mataura coalfield (steam generation). As dusk was approaching a quick visit to the lignite mine enabled members to view the source of the brown coal and also to fossick for silicified tree stumps.

On Saturday morning in perfect weather, most of the party became instant rock hounds during a visit to the Pebbly Hills gravel quarry where at least two hundred million tonnes of silica of the required purity for a ferrosilicon industry is found. The rock hounding transmuted into a search which was extremely successful for fossilised gum (probably from kauri trees) in the lignite at the Goodwin Coal Mine.

Finally, a quest for gold and marcasite was realised in the subsoil of a gully in the Waimumu Hills where an unusual alluvium containing gold and crystallising FeS_2 with associated strongly acidic and sulfurous meteoric water is found. Members reluctantly departed from the green hills and bright sunshine of eastern Southland for their return journeys.

Barbara Duncan

WAIKATO BRANCH

Kris Basden and Roy Tasker addressed the July Branch meeting with a talk entitled "Oxygen, Life and Count Dracula". This was a thoroughly entertaining talk and was well received by an enthusiastic crowd of about 350 people, including many pupils from both Hamilton schools, and those in the greater Waikato region as far away as Te Kuiti and Otorohanga. The talk was considered by many to be the highlight of the year.

Stan Winter, the NZIC President addressed the August meeting with a talk entitled "Green Grass, Black Cows, White Milk and Other Challenges for the Practising Chemist".

The winner of the J.E. Allan Memorial Prize for 1992 was Craig Depree. A plaque listing all past winners since the inception of the prize in 1973 is now on display in the Chemistry Department of the University of Waikato.

The Analytical Chemistry Competition involving analysis of vitamin C in vitamin tablets, attracted eleven entries of good standard. Prizes awarded were:

First: James Neale and Tane Brunt, Church College.
Second: William Martin and Villiami Sika, Church College.
Third Equal: Greg Somers, Cambridge High School, and Richard Mason and Meihing Young, Fairfield College.

NZ GEOCHEMICAL GROUP NEWS

The NZ Geochemical Group held its 14th Conference and 15th Biennial General Meeting in Waihi earlier this year.

Office Holders: 1993-1995

President: Mel Carr, Chemistry Dept, University of Otago.
Secretary: Bruce Finlayson, Institute of Geological & Nuclear Sciences, Wairakei
Treasurer: Dick Glover, Institute of Geological and Nuclear Sciences, Wairakei
Committee: Chris Hendy, Chemistry Dept, University of Waikato
Stuart Simmons, Geothermal Institute, University of Auckland
Ian Graham, Institute of Geological and Nuclear Sciences, Lower Hutt
Dave Craw, Geology Dept, University of Otago.

Editor-in-Chief, Newsletter Production and Distribution:
Graeme Lyon, Institute of Geological & Nuclear Sciences, P.O. Box 31312, Lower Hutt.

<u>1993 - 1995 Subscriptions</u>

The Group welcomes anyone with an interest in geochemistry. Subscriptions for 1993-95 are due as follows:

New Zealand members	NZ$8.00 for 2 years
or	NZ$60.00 life membership
Overseas members	NZ$12.00 for 2 years
or	NZ$90.00 life membership
New Zealand libraries	NZ$10.00 for 2 years
Overseas libraries	NZ$14.00 for 2 years.

(Overseas payments should be in New Zealand dollars by bank cheque, postal note or international money order).

Subscriptions should be sent to:

Dr. R.B. Glover,
Hon. Treasurer,
Wairakei Research Centre,
Institute of Geological & Nuclear Sciences,
Private Bag 2000,
Taupo
New Zealand.

INORGANIC AND ORGANOMETALLIC GROUP NEWS

The X-ray diffractometer at the Chemistry Department, University of Canterbury is now back from an upgrade trip to the Siemen's factory in Madison, Winsconsin. It is now again available for continuous low temperature X-ray data collection for New Zealand scientists who what to make use of it. Email messages concerning data collections proposed, or in progress should be directed to:

CHEM.132@csc.Canterbury.ac.nz.

Invited speakers for the Inorganic/Organometallic symposium at this year's NZIC conference in December include T D Tilley (U.C San Diego), H Ogino (Tohoku University, Sandai, Japan) and W R Cullen (U.B.C.). There is no specified theme for the symposium although some focus on transition metal - main group compounds may be discernible.

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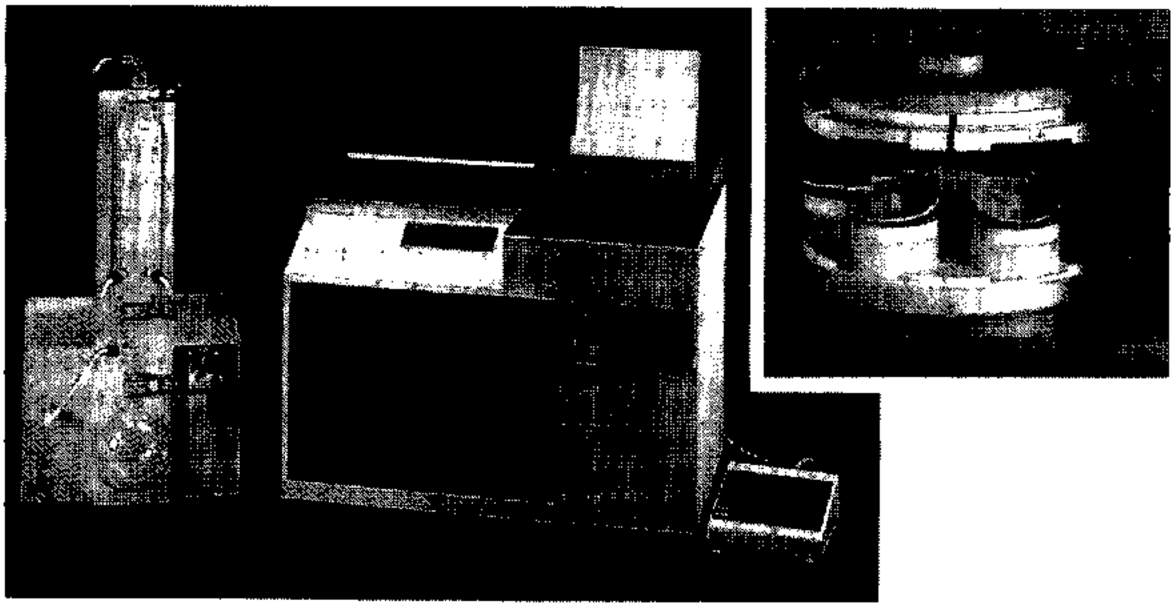

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OBITUARY

MR E W HULLETT

Mr Hullett, a former President of the NZIC and Honorary Fellow, died recently at Woodbury, South Canterbury, aged 88.

Ernest William Hullett gained a MSc with Honours in Chemistry at the then Canterbury University College and after a period lecturing in chemistry at Lincoln College, joined the Christchurch laboratory of the DSIR's Wheat Research Institute in 1934. In 1936 he was appointed Chief Chemist and as such he was in charge of the laboratory, and remained so until his retirement in 1965. He held the title of Director from 1950, when the wheat breeding section of the Institute was merged with the DSIR's Crop Research Division, with the Christchurch laboratory retaining the name of Wheat Research Institute.

The Institute had been founded in 1928, with the object of applying science to the Industry's problems, and with the financial support of wheat growers, millers and bakers. Continued support depended on results and there were skeptics who doubted that scientists could be of much use to the "real" world. Mr Hullett was one of the pioneers who helped to dispel such doubts. As well as overseeing the work of the laboratory, he made major contributions in many areas, including milling techniques for raising the vitamin content of flour, adapting the baking process to mechanisation and controlling steam in ovens.

His greatest achievement was the introduction of pre-purchase testing of the wheat crop, whereby samples from each of thousands of parcels of wheat were rapidly milled and baked to give an indication of quality. The system which evolved was unique, and novel equipment had to be devised and built. This was a team effort, but the vision and drive were Mr Hullett's. There was also a good deal of prejudice to be overcome in some quarters and here his formidable ability as an advocate was crucial. The system has been superseded as mills have acquired their own testing facilities, but it served the industry well for 20 years and was an enormous advance in giving millers better control of their raw material.

A versatile and practical scientist, he built and operated an amateur radio transmitter in the thirties. During World War II he worked in the DSIR's Defence Development Department at Canterbury University College on highly secret radar aerial controls, and was in charge for a time.
He mastered German and used it to study German milling and baking publications, and to make personal contacts on a study trip in 1937, which he maintained by correspondence and later visits.

He was an Honorary Member of the British Flour Milling and Baking Research Association and a member of the American Association of Cereal Chemists. He was an Honorary Member and former President of the Canterbury Branch of the Royal Society of New Zealand, and a Professional Member of the New Zealand Institute of Food Science and Technology.

After his retirement from the Wheat Research Institute Mr Hullett continued his association with the industry as a valued member of the board of the Ireland Group and as a consultant to Baker Perkins and other companies. He also waged a vigorous and well researched campaign for the fluoridation of water. In recognition of this he was elected an Honorary Member of the New Zealand Dental Association.

As a young man he was an active tramper and mountaineer, and one of the founders of the Youth Hostel Association of Christchurch.

He is survived by his wife Alice and his two daughters.

* * * * *

New Zealand Students Win Medals in Italy at the International Chemistry Olympiad

All 4 New Zealand students won medals at the 25th International Chemistry Olympiad which was held 11-22 July, 1993, in Perugia, Italy.

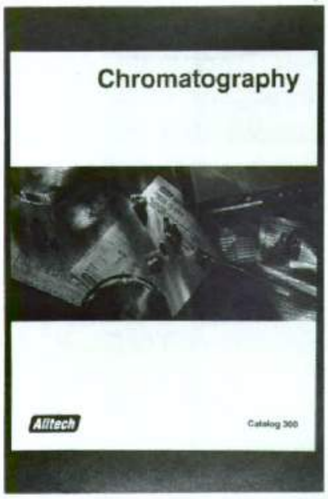
Silver medals were won by David Yuen, aged 18, a student of Selwyn College, Auckland, and Andrew Gilbert, aged 17, a student of Palmerston North Boys' High School, and Bronze medals were won by Jason Tseung, aged 17, and Simon Blakey, aged 17, both students at Auckland Grammar School.

They were competing with secondary school students from 37 other countries. This result put New Zealand in the upper third of the competition, at equal twelfth place with the Czech Republic and Romania, and ahead of Australia, France and the U.K., a remarkable achievement when one realises that most of the students they were competing against were older and had completed their last year at secondary school.

The team were accompanied by Mr. Tim Oughton, a teacher from Rangiora High School, who is currently at the Christchurch College of Education, and Dr. Sheila Woodgate, of the Chemistry Department, University of Auckland.

The team wishes to thank all the sponsors and the NZIC for their financial support.

Alltech's New Chromatography Catalog



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For further information circle number 15 on the reader reply card

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Their objective is to represent members' interests in the growth and development of their businesses and to assist this target with the provision of a professional Exhibition Management Service.

Professional Exhibition Management Service...

Exhibitions provide an essential and valuable link between the consumer and the supplier. On behalf of members, HISANZ offers Health and Scientific Industry Conference Organising Committees a complimentary Exhibition Management Service which is efficient, professional and has a results driven commitment to ensuring both Conference Societies and Exhibitors achieve maximum returns from every conference. Consequently, the entire industry can benefit from a consistently professional service which delivers the very best from each promotional dollar.

Making Policy Work for You...

A dramatically changing environment means that moves within these industries need constant monitoring. HISANZ achieves this through specific representation and negotiations. They head industry backed initiatives at both Governmental and local authority levels to support issues which most impact members. The result – a mutually beneficial and advantageous environment in which members businesses can achieve their fullest potential.

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For further information circle number 16 on the reader reply card

NEW LITERATURE & MEDIA

(i) W. Edward Billups, Marco A. Ciufolini
Buckminsterfullerenes

The book is organised into four sections:

- The main events leading to the discovery and preliminary studies of fullerenes
- Theoretical studies of fulleroid cages
- Superconductivity properties
- Exo and endohedral complexes and some chemical properties of these new materials.

Invaluable reference for all interested in the potential application of this new class of materials.

Published by: VCH Verlagsgesellescaft
P.O. Box 101161, D-69451,
Weinheim, Germany.

Further details from The Editor, Chemistry In New Zealand.

(ii) Michael Buback, Hans Peter Vogele
FT-NIR ATLAS

A unique volume providing the first collection of high-quality digital NIR spectra. It contains a total of 3800 spectra of 1900 common organic chemicals. A wealth of information on each compound accompanies individual spectra.

Published by: VCH Verlagsgesellescaft
P O Box 101161, D-69451,
Weinheim, Germany.

Further details from The Editor, Chemistry In New Zealand.

(iii) Bernhard K. Kepplier
Metal Complexes In Cancer Chemotherapy

A critical overview of both clinical and experimental aspects of metal complexes in cancer chemotherapy. Topics treated in depth include:

- Synthesis of metal complexes for cancer chemotherapy.
- Metal complexes in clinical and preclinical trials.
- The mechanism of action of tumour-inhibiting metal complexes.

Published by: VCH Verlagsgesellescaft
P.O. Box 101161, D-69451,
Weinheim, Germany.

Further details from The Editor, Chemistry In New Zealand.

(iv) K. Krohn, H.A. Kirst, H. Maag
Antibiotics and Antiviral Compounds
Chemical Synthesis and Modification

Covers recent developments in the important aspects of chemical synthesis of both antibiotics and antiviral substances. Researchers and students in preparative organic chemistry/bio-chemistry/medicinal chemistry will find this indispensable in their daily work.

Published by: VCH Verlagsgesellescaft
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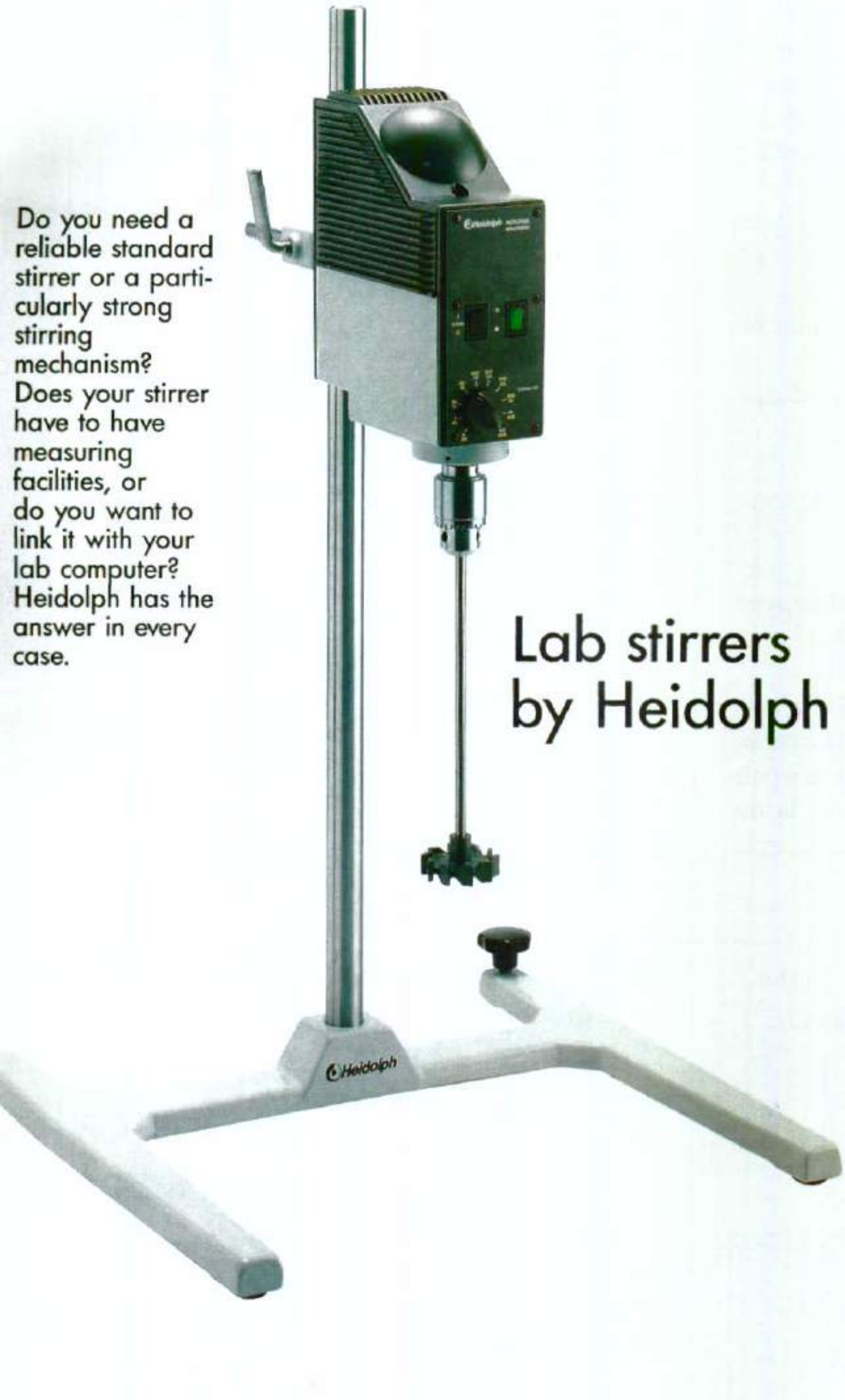

CHEMICAL PROCESSES IN NEW ZEALAND

Preparation of a Second Edition

Volume one of "Chemical Processes in New Zealand" is now very much out of date and also out of stock. With the advent of a new chemistry curriculum now seems the right time to start work on a new edition.

As in the case of the two earlier volumes, many hands will make light of the work. With $20,000 in hand there is no need to start with a fund raising campaign. With the development of word processing and chemical drawing packages it should be easy to produce cheaply a much more professional looking edition without resorting to a commercial publisher.

The things that need to be done are as follows:

1. Identify topics or processes on which to write articles.
2. Find volunteers to accept responsibility for producing a draft article.
3. Find volunteers to be members of the editorial team (perhaps about six).
4. Make editorial decisions on what general information we should attempt to include in each article.

Thus I now ask for teachers and professional chemists (retired or not) to volunteer their services or ideas. Most of the articles of Volume One were produced by teachers writing an article with the help of a professional chemist employed in the process being written about. This proved a very successful approach.

Please contact me personally, or by letter or fax.
My address is:

Dr. J. E. Packer, Chemistry Department,
University of Auckland,
Private Bag 92019, Auckland.
Ph. (09) 373 7599 ext 8315
Fax (09) 373 7422.

CHROMATOGRAPHY '94

Following on from the success of CHROMATOGRAPHY '92, the Australia wide consortium of scientific equipment suppliers in conjunction with the RACI Analytical Group (NSW) are pleased to announce the launch of:

CHROMATOGRAPHY '94
JULY 19-21, 1994
AUSTRALIAN JOCKEY CLUB
ALISON ROAD
RANDWICK, NSW

Australian and overseas speakers will be presenting the latest developments in both the theory and practice of Chromatography over the three days of the Conference.

PLUS more than 26 instrument and accessory suppliers will be mounting displays for a Chromatography exhibition of working instrumentation which will be FREE for all to attend. Mark it in your diary now - **July 19-21, 1994** - and look for more details in coming issues of :

'CHEMISTRY IN NEW ZEALAND'

Contact: Dr S Grant Wyllie
RACI Analytical Group
(NSW)

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University Extension
University of Otago
PO Box 56 Telephone (03) 479 8484
Dunedin Facsimile (03) 477 5003

University of Otago
Distance Learning Programme

MASSEY UNIVERSITY

PhD SCHOLARSHIP IN SYNTHETIC ORGANIC CHEMISTRY

Department of Chemistry and Biochemistry

Applications are invited for a 3-year PhD Scholarship, commencing on 1 March 1994, to work with Dr M S Sherburn in the field of Synthetic Organic Chemistry. The department is well equipped and has vigorous research programmes in a wide variety of areas.

The project will involve research in the general area of enantioselective synthesis, with particular emphasis on the development of new methodology directed towards the chemical synthesis of biologically important compounds. Enquiries concerning the research project should be directed to Dr M S Sherburn (email sherburn@rsc3.anu.edu.au, fax: (61) 6 249-5995).

Applicants should have, or expect to receive, a first or upper second class honours degree in Chemistry. The stipend will be $12,000 p.a.

Closing date: 15 October 1993.

Applications, including a full curriculum vitae and the names, fax numbers and addresses of two academic referees, should be sent to Professor A M Brodie, Department of Chemistry and Biochemistry, Massey University, Palmerston North, New Zealand. Further information concerning the department may be obtained from Professor A M Brodie (email A.Brodie@massey.ac.nz or fax (06) 350-5682).

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THE UNIVERSITY OF AUCKLAND

CHAIR IN APPLIED/ ENVIRONMENT CHEMISTRY

Division of Science and Technology, Tamaki Campus

Vacancy UAC.331

The appointment arises because of the expansion of chemistry on the University's new Tamaki Campus.

The campus is planned to have 3,000 students by 1995 and ultimately approximately 7,000 students. The university seeks to appoint an outstanding academic who will provide leadership in the development of chemistry courses and research in the new campus. Current courses taught there include a BSc in Environmental Management and present and planned courses provide the chemistry component of the degree. Other themes will be developed along with expansion of existing courses from the city to the Tamaki Campus.

The appointment in the Department of Chemistry is as part of the Science and Technology Division of the Tamaki Campus. The Professor's primary teaching and administrative commitments will be at the Tamaki Campus but the appointee will have full access to the departmental facilities on the City Campus and, in particular, to teaching at advanced level and to research facilities. Research and research facilities will be developed at Tamaki in close cooperation with those in the city.

Applicants must be well qualified with a high level of achievement in research and potential or proven leadership qualities in teaching and administration, in areas of applied chemistry. The university is particularly interested in environmental chemistry but will consider outstanding candidates in other areas of chemistry congruent with developments on the Tamaki Campus.

Commencing salary will be established within the range $80,080 - $99,840 per annum.

Further information, Conditions of Appointment and Method of Application, should be obtained from the Academic Appointments Office, University of Auckland, Private Bag 92019, Auckland, phone (09) 373-7999, ext 5097, fax (09) 373-7454. **Three copies of applications should be forwarded to reach the Registrar by 1 November 1993.**

AUCKLAND UNIVERSITY RESEARCH COMMITTEE POSTDOCTORAL FELLOWSHIPS

Vacancy UAC.327

The Computational Materials Science and Engineering Research Centre has funding for a postdoctoral position for a two-year period. Present research is being carried out at the theoretical, numerical modelling and experimental levels on advanced ceramics, new carbon based materials and heavy element chemistry. We seek support in the computation of the properties of molecules, clusters and bulk materials. Applicants should have completed their PhD and have a strong background in theoretical/ computational inorganic chemistry, solid state physics or materials science.

For further information please contact: J S McFeaters, P Schwerdtfeger or M Liddell, e-mail: cmc_@ccnovl.auckland.ac.nz, fax (09) 373-7479. More detailed Conditions of Appointment are available on request.

Emolument will be $35,000 per annum, plus $4,000 toward airfares.

Two copies of applications, in the form of a detailed curriculum vitae (including any relevant reprints) and the names and contact details of two or more independent referees should be forwarded to reach the Registrar, University of Auckland, Private Bag 92019, Auckland, **by 29 October 1993.**

Please quote Relevant Vacancy Number in all correspondence.

W B NICOLL, REGISTRAR

The University has an EEO policy and welcomes applications from all qualified persons

BOOK REVIEW

REDUCTIONS BY THE ALUMINO AND BOROHYDRIDES IN ORGANIC SYNTHESIS

Author: J. Seyden-Penne
VCH PUBLISHERS INC., 1991 (193 pages, DM 108.00)

The two main weapons in the chemist's arsenal of reducing agents are the alumino- and borohydrides. This book reviews the potential of the main commercial hydrides and their simple derivatives for reducing a range of common functional groups. The author has chosen to target this work at the practising synthetic organic chemist, and places her emphasis on the chemoselectivity, yield, regio- and stereoselectivity of the reagents. The book is divided into three main sections:

- description and characterisation of the main reagents
- a breakdown of the reactions of common functional groups with the hydride reagents, with reference to control of relative and absolute stereochemistry and also to the chemo- and regioselectivity of the reactions
- synoptic tables based on target functional groups that can be accessed via hydride reductions.

This book is a welcome addition to the review literature of organic synthesis. Although the bibliography is far from exhaustive, there are references to a range of recent review articles. The synoptic tables are particularly useful for finding suitable reactions leading to target functional groups. The book is reasonably up-to-date, concise, and fairly well organised. The translation from French is fairly seamless, although there are a few lapses with "the" definite articles. It would be expected that this book may well gain the distinction of becoming well thumbed should it escape the clutches of the librarians, and take its rightful place on the laboratory bookshelf.

Rick Ede,
Lecturer in Organic Chemistry,
Chemistry Department, University of Waikato.

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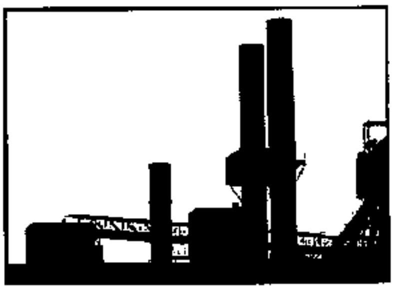


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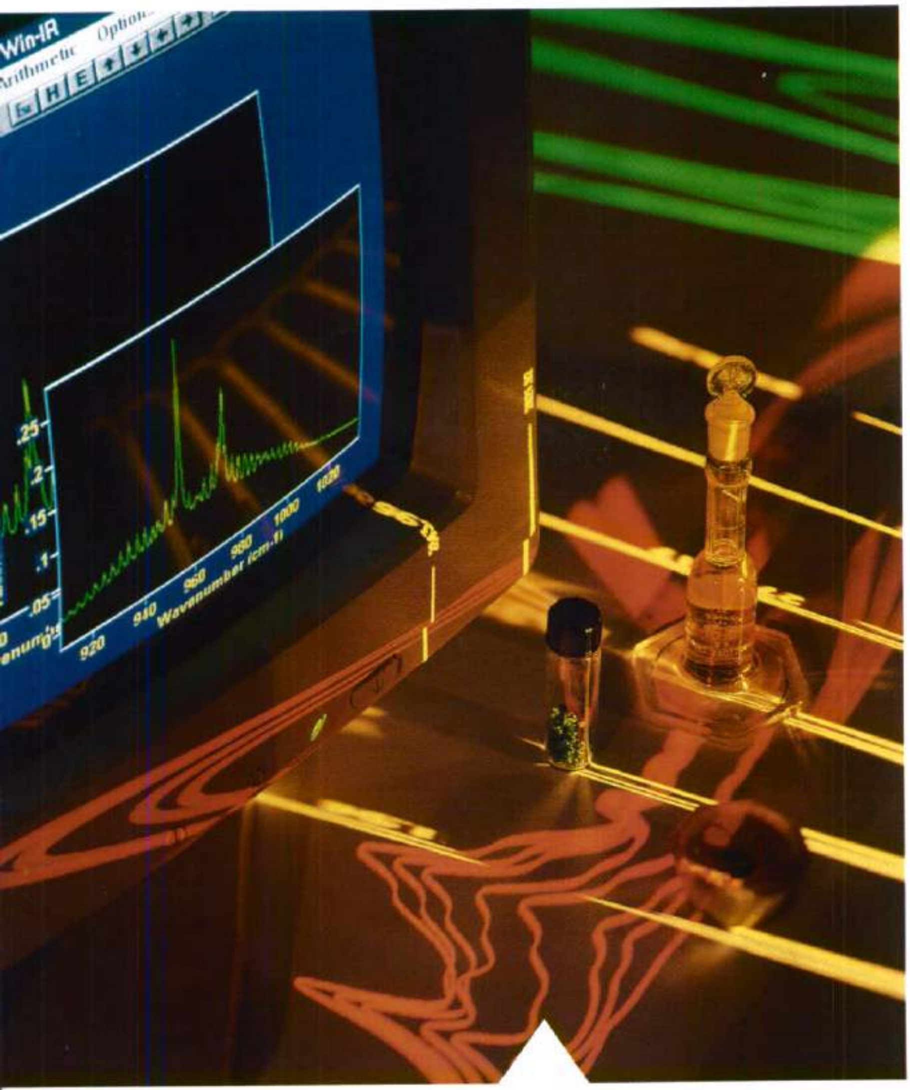

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