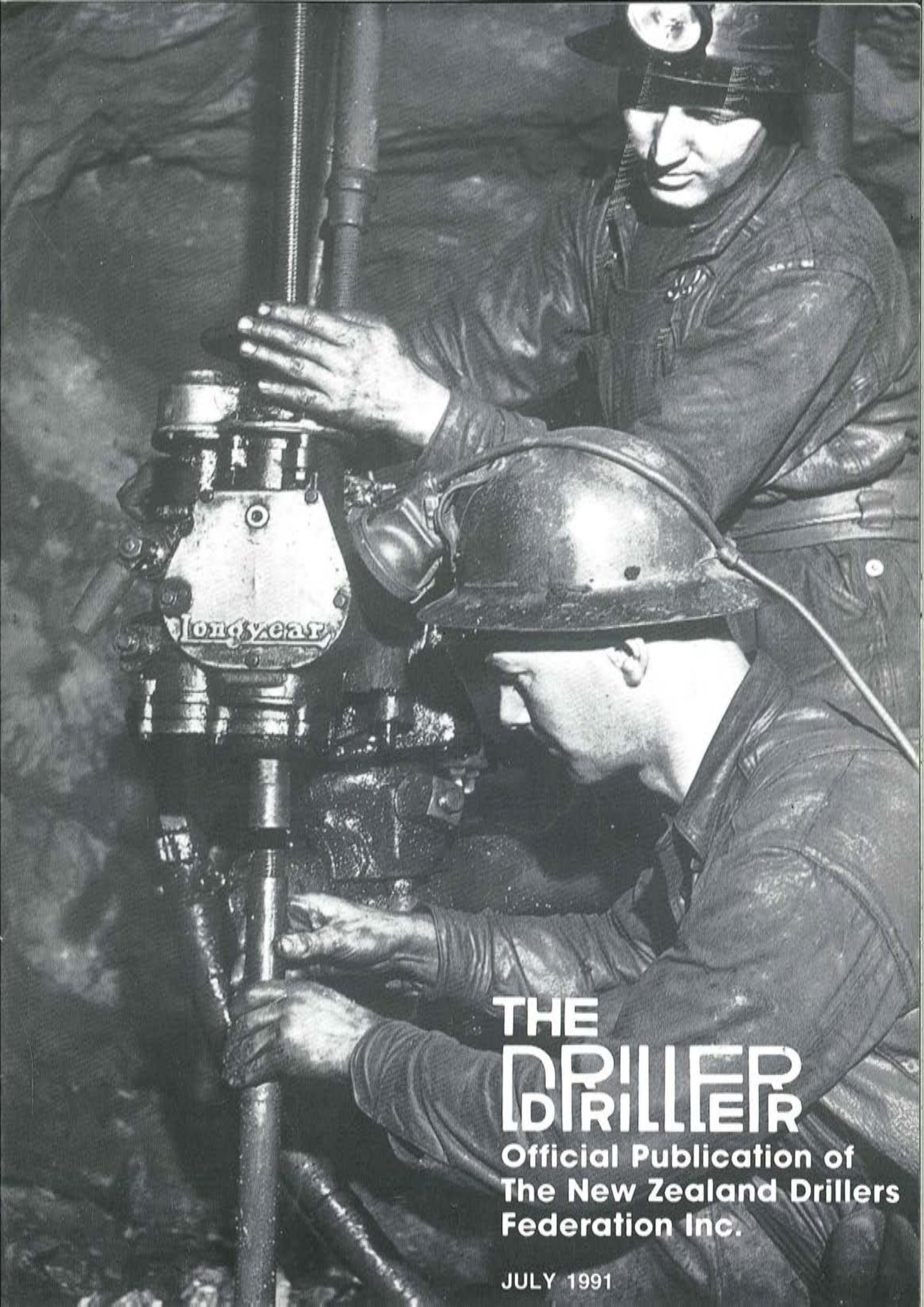

THE DRILLER

Official Publication of The New Zealand Drillers Federation Inc.

JULY 1991

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PRESIDENT'S REPORT

IT doesn't seem like a year since Bain Webster's excellent NZDF Conference in Wellington and OK it's not, but only by three weeks.

The reason for this Conference being earlier this year is mainly because of the Australian Conference being an international one, held at Darwin right on our usual time, and together with that, I have to attend the NZ Racing Conference in mid-July.

There has been a general downturn in demand for drilling services:

Hamish Pearson, from McNeil Drilling Co Ltd, tells me he operates in three centres — Invercargill, Dunedin and Alexandra, with water well and site investigation drilling, foundation piling, pump and irrigation sales and service. He says work started to dry up about mid-March and things are not looking good for the future, with nothing coming out for tender at the moment.

Bill Washington, from Washington's Drilling in Timaru, has been having a patchy run of work also and is very quiet at the moment.

Lyall McMillan, from McMillan Water Wells in Southbridge, says in his area the only upward movement is in domestic and small farm development. Lyall says really he is the quietest work-wise that he has been for four years, but as the Ranfurly Shield edges its way south this year he says Canterbury confidence will bloom! How about that!

Ourselves from Waimea Drilling Co Ltd have also had a patchy year but have managed to keep two rigs busy half of the time. The immediate future looks OK with a bit of activity in Blenheim and some movement from the apple, grape and tea growers in Motueka. In Nelson new water wells are very few and far between, but there is some site investigation work. Bain Webster, from Webster Drilling in Wellington, says there is just nothing happening around his area, so he will have plenty of time to come to the Conference in his yacht.

No news from Neil Richardson in Palmerston North, but Doug Honnor from Honnor Well Drillers Ltd, Hawkes Bay, says things are not good in his area, but he and son Greg will be digging out some savings as Greg is coming to the Blenheim Conference and Doug and his wife are going to the Darwin Conference.

Len Brown from Drillwell Exploration in the Auckland area says they have been having a good run with provincial work, but it's a bit quiet at home. Len says they got a bit lucky at Clyde. They finished their contract down there and sold two specialised rigs to the successful tenderer of the current drilling programme. Len also says brother Martin was busy in Taranaki on some "seismic test" hole drilling.

I dare say all we can do is take things as they come at the moment and if necessary diversify a little to ride out the rough bits. We at Waimea Drilling need to, in the near future, replace at least one of our rigs. The cost of an imported custom-built rig is completely out of the question, so we are developing our own machine shop to build our own, during slack work demand periods. We may attract some otuwork that would assist us to survive.

One thing is for sure we are not going to give up easily.

Best of luck to you all.

C.B. "Woody" Woodford
President

THANKS

THE New Zealand Drillers Federation wishes to thank the advertisers in this publication: Longyear New Zealand Ltd; Brown Brothers Engineers Ltd; Air New Zealand; Waimea Drilling Company Ltd; Dominion Construction Ltd; Mintech (NZ) Ltd; McMillan Water Wells Ltd; Drillwell Exploration NZ Ltd.

NZDF
NEW ZEALAND DRILLERS FEDERATION INC.

DRILL '91

NEW ZEALAND FEDERATION ANNUAL CONFERENCE
JULY 3rd, 4th & 5th 1991
Blenheim Country Lodge Cnr Alfred and Henry Streets

This year's conference/trade displays will be held at the Blenheim Country Lodge. The venue offers all facilities and is within walking distance of the shops and amenities of Blenheim.

PRELIMINARY PROGRAMME

Wednesday July 3		4.30pm	Registration - Satchels sponsored by Brown Bros. Eng. Ltd
		6.00pm	Cocktails (sponsored by Grundfoss Pumps Ltd)
Thursday July 4		9.00am	Opening address by Minister of Energy
	Session 1	9.30am	Marlborough Artesian and Groundwater System - Nelson Marlborough District Council
	Session 2	10.00am	Security - Crown Securities - Dave Birdling
		10.30am	Morning Tea
	Session 3	11.00am	Nelson-Moutere Artesian and Groundwater Systems - Nelson-Marlborough District Council.
	Session 4	11.30am	Public Liability Insurance and Contracts - International Insurance Brokers
		12.30pm	Lunch
	Session 5	1.30pm	Site Investigation Drilling - Tonkin & Taylor
	Session 6	2.00pm	Submersible Pump Care & Maintenance - Peter Jones
	Session 7	2.30pm	Workshop Machines and Tools - Brian Scott
		3.00pm	Afternoon tea
	Session 8	3.30pm	Update on Modern Drill Fluid Make-up
	Session 9	4.00pm	Drilling for Contaminant Recovery under treatment plants
		5.00pm	NZDF Annual General Meeting
		6.00pm	Cocktails (sponsored by Longyear NZ Ltd)
		8.00pm	New Products session
Friday July 5			
	Session 10	9.00am	Employment Contracts Act 1991 - Mr Malone, Fletcher, Vautier, Moore, Solicitors
	Session 11	9.30am	Electrical Control & Wiring of Submersible Pump Motors
		10.00am	Morning Tea
		10.15am	Field Trip
		12.30pm	Lunch
			Continue Field Trip and return
		7.30pm	Dinner (wine sponsored by Grundfoss Pumps Ltd)

The final detailed programme together with the field trip details will be presented immediately prior to the conference.

Your Host Drilling Coy:
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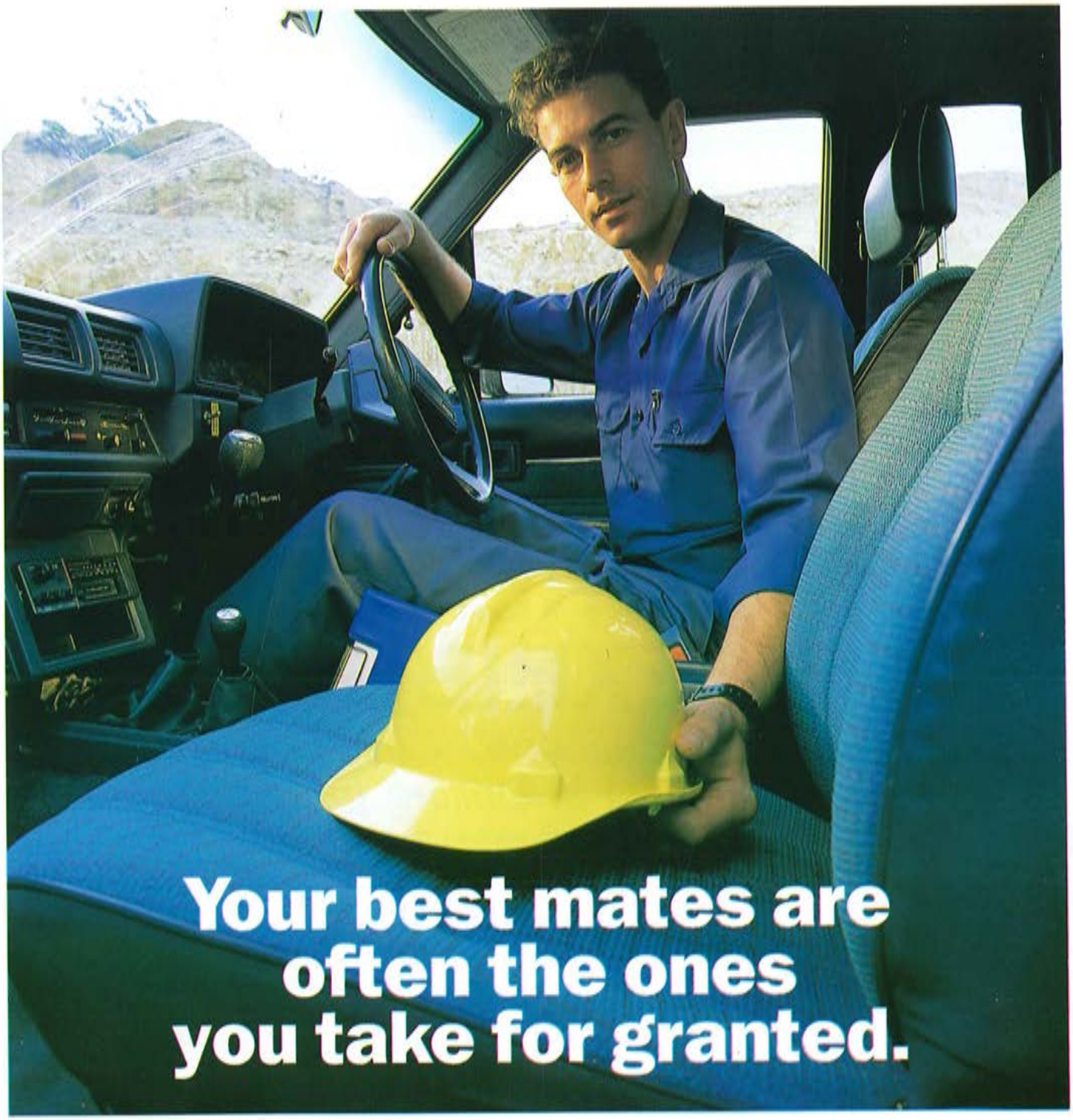


Your hard hat, for example. You never give it much thought but if ever you need it, it will be there to help.

Or take Longyear. Our commitment to research and development means that you can expect products of the highest quality. And because at Longyear we recognise the need for co-operation, partnership and mutual respect, you can take our high standards of service for granted too.

This is the kind of trust and confidence that only builds up over time, and we've been serving Australia for a very long time now.

Longyear

Just last year, you may remember, we established the Longyear Australia Foundation, to provide financial assistance for scientific and medical research.

In 1991 the Foundation will continue to support the pioneering work done by the Skin Bank in Sydney, developing human skin cultures for the treatment of severe burn injuries, skin cancers and other diseases.

It's a worthwhile cause, because it means that we can help not only our customers and colleagues in the mining industry, but all Australians. After all, what are mates for?

WLA 0113

AIR New Zealand has put together a package for any drillers wishing to attend the international conference in Darwin.

The trip is from either Auckland or Wellington, to Brisbane and then on to Darwin.

Air New Zealand says Darwin is a difficult destination to get to. It says domestic flights are restricted and usually solidly patronised well in advance.

It is possible to fly from Cairns to Darwin, but flights around the time of the conference are heavily booked.

Air New Zealand's package is via Brisbane, where an overnight stay is required.

The full itinerary is: July 25, Wellington or Auckland to Brisbane. Overnight in Brisbane. July 26, 9.10am flight Brisbane to Darwin, arriving 12.50pm. Return August 2: Darwin to Brisbane 8am. Overnight in Brisbane. Brisbane to Wellington or Auckland, August 3.

Air New Zealand says it can arrange overnight stays in Brisbane from $NZ53 a night twin.

The cost of the trip $NZ1961 ex Wellington or Auckland. Air New Zealand says discounts from 3% to 9% are possible depending on the number of bookings.

Anyone interested in attending the international conference should contact the President: "Woody" Woodford Ph 054 48442, or Murray Sharp 06 3645103.

Air New Zealand says early booking would be appreciated to ensure domestic flights to Darwin can be booked.

DRILL '91 INTERNATIONAL CONFERENCE AND EXHIBITION

"Towards Excellence — Promoting Professionalism In Drilling Industry"

27th-30th July, 1991. Darwin, Northern Territory, Australia

THE South Australian/Northern Territory branch of the ADIA extends a warm welcome to Drill '91 in Darwin, the Territory's capital — a modern, multi-cultural city set on the shores of one of Australia's largest harbours and home to almost 80,000 people in the "Top End".

This unique city is the base for tours to Kakadu National Park, Melville and Bathurst Islands, the flood plains of the Mary River, Litchfield National Park, and the Daly and Adelaide Rivers.

The venue chosen for the Drill '91 Conference and Exhibition is the Beaufort Hotel, a 5-star hotel and convention centre offering every facility for the most discerning delegate.

Additional accommodation is available at the Atrium Hotel, which is approximately five minutes comfortable walk from the main venue.

Drill '91 programme highlights

The Australian Drilling Industry Association (ADIA) has since its inception more than two decades ago, encouraged the achievement of the highest possible standards of performance, integrity and ethical dealing in the drilling industry, thus endeavouring to maintain a professional public reputation and high level of credibility among industry suppliers and customers.

This year's conference theme will focus on "professionalism" and reinforce the need for our industry to develop new attitudes and habits to survive and grow in the difficult economic climate which currently prevails.

Session topics have been chosen to cover a broad range of issues impacting on our industry and will also include addresses by a number of international delegates on their experiences.

A comprehensive Trade Exhibition of products, equipment and services will run concurrently with the conference, affording delegates the opportunity to browse through the booths and discuss products with the exhibitors.

The Castrol Drill Skill '91 competition, with substantial cash prizes to be won, will follow a "Buffalo and Barramundi BBQ Lunch" on Tuesday, 30th July.

Local sightseeing tours in air-conditioned coaches have been arranged for accompanying partners over the three days of the conference, followed by a three day Post Conference Technical Tour to Kakadu National Park, which includes a visit to the Ranger uranium mine to witness their drilling and blasting operation — time has been allocated for discussions with the appropriate mine site personnel.

Convention Catalysts in Darwin have been appointed the Conference Co-ordinators for Drill '91. All travel to and from Darwin can be booked through them. They can provide information and assistance on all aspects of your travel, including domestic and internatioanl flights, accommodation and tour requirements.

For further information, contact Convention Catalysts: Darwin (089) 81 1875; Fax (089) 41 2815.

Apprenticeship slump worries Minister

Rt Hon Bill Birch

MINISTER of Labour, the honourable Bill Birch, has repeated his concern that a shortage of skilled tradesmen will hamper New Zealand's economic recovery.

Mr Birch spoke during a visit to a West Auckland engineering firm to observe the success of young apprentices there who had graduated from the Auckland Technical Institute's Access student programme.

Contra-Shear Engineering, a designer, manufacturer and exporter of sewage and waste water screening equipment, has two former Access students among its apprentices and expects to start a third shortly.

Apprenticeships had "collapsed" in number throughout New Zealand to about a third of the level of nine years ago, said Mr Birch. Economic growth was at risk if the situation could not be turned around, he said.

Far too many young people were coming out of school and moving into long-term unemployment, Mr Birch said. The Minister of Employment, Mr McTigue, would be announcing a wide range of measures, about the middle of the year, to counter this and other issues.

The Minister's visit to Contra-Shear was arranged by his former Cabinet colleague, the dean of the ATI's Faculty of Science and Engineering, Dr Ian Shearer. The ATI expects to train more than 180 Access students in engineering-based courses this year, said Dr Shearer, and he wanted to point to some of the significant successes of individual students such as those at Contra-Shear.

Michael Lynch, who has a severe hearing disability, and Daniel Tavaleoni were Access students at the ATI in 1989 and joined Contra-Shear the following year. As a result of their Access training they were granted a reduction of 1000 hours and 800 hours respectively in their apprenticeships.

Both Michael and Daniel started with very limited qualifications but are expected to receive their second qualifications in sheetmetal work this year and go on to Trade and Advanced Trade Certificates.

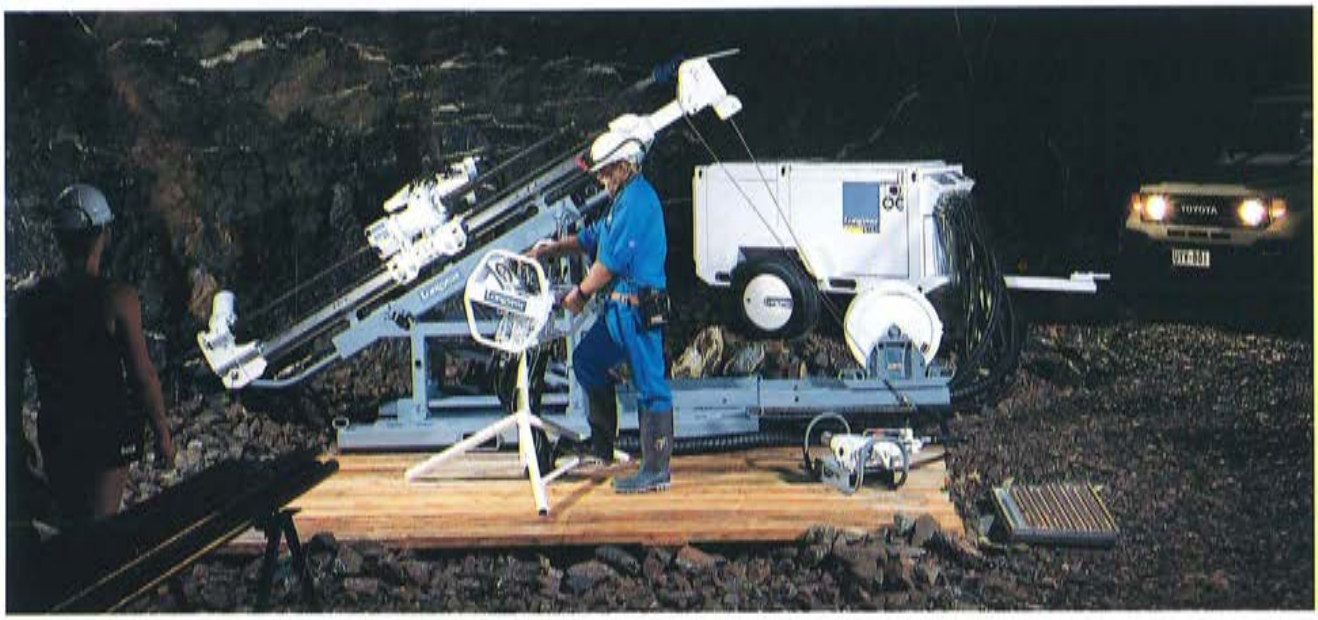
Recent work activity has seen them involved with an order from the Soviet Union for six waste water screens to be used in the food industry. Contra-Shear sent four screens to the Soviet Union last year and also exports to many other countries.

The ATI is running 13 Access courses of 18 weeks each this year. The courses include pre-fitting and turning, sheetmetal work, welding, stainless steel welding and a special course for women in engineering.

Dr Shearer conceded that there were not a lot of jobs available in engineering at present. But the ATI was determined to give students the best training available and fit them for gaining qualifications that were recognised internationally.

Mr Birch said he regarded as very important the link between firms such as Contra-Shear and the polytechnics. New Zealand's economic recovery was likely to be based on the smaller businesses such as Contra-Shear which used Kiwi ingenuity to develop technology and went on to exploit it, working closely with the polytechs and also providing in-house training.

Longyear
LM45



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More Core

Fast, compact and powerful, the Longyear LM45 Diamond Core Drill System puts core in the tray quickly and efficiently.

The LM45 system consists of a range of carefully designed and matched equipment refined by extensive field testing. All items have been built for rugged reliability, ease of operation and simplified maintenance.

Efficient and Reliable

Making effective use of modern hydraulic componentry, the LM45 Power Pack converts input power to power at the chuck more efficiently than ever before. All Feed Frame components have been engineered to ensure reliable, long term performance under high speed rod handling.

Easy to Operate

Longyear LM drills are renowned for their precise, uncomplicated controls. Simple, proportional regulation of bit speeds and feed rates maximises production and reduces bit costs. The control panel is light and ergonomically designed to enhance operator comfort and safety.

Longyear Quality and Service

Technical support is available world-wide to assist with commissioning, training of operators and service personnel, and supply of genuine spare parts. The LM45 is manufactured under Longyear's Total Quality Control system.

For further product information contact Longyear.

Longyear LM45
Compact Diamond Core Drill System

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Longyear serves world industry

LONGYEAR serves the minerals and environmental drilling industries worldwide. It designs and manufactures a complete line of core drills, diamond bits, and down-hole tools.

It offers contract drilling services in the fields of mineral exploration, geotechnical investigation, environmental monitoring, and oil and gas exploration.

Longyear's equipment and services are available from bases in North and South America, Europe, Africa, Asia, Australia and New Zealand and it provides a prompt service throughout the world.

Mining engineer Edmund J. Longyear, the founder of the Longyear Company, first began work as a diamond drilling contractor in the Mesabi Iron Range of Minnesota, U.S.A., in 1890.

The emphasis he placed on quality and service to his customers, and the way he valued his people, established the principles that have guided Longyear's development to this day.

By the early 1900s, Edmund J. Longyear was working for customers in many mining regions, and soon his contract drilling activities spread throughout the world. At the same time, he began to manufacture drilling machines and tools for other drillers, as well as to satisfy the needs of his own contracting operations.

The design of Longyear tools is based on practical field considerations and close co-operation between its engineers and field operators.

In addition to the introduction of wireline to the core drilling industry in the 1950s, Longyear has led the way in improving drilling productivity and reducing costs through the continual evolution of new products and close attention to customer needs.

Significant Longyear innovations range from fundamentally new designs such as the LM and LMP models of long feed hydraulic and multi-purpose drills to important improvements such as the induction hardened "Q" wireline drill rods and the current "Series" impregnated bits.

Product development teams work continuously on new and improved Longyear products. They use the latest in computer-aided design techniques and draw upon knowledge gained through decades of drilling experience to stay current with industry's demands.

In ten plants worldwide, skilled people manufacture Longyear tools using the most modern manufacturing processes and equipment.

Each Longyear facility is committed to stringent quality assurance programs. Computerized inspection equipment and electronic gauging play an integral part in its commitment to provide the best possible product to customers.

The tools that make up Longyear drilling systems are backed by a network of distribution and service centres all over the world.

These centres are staffed by trained specialists who can help drillers in the field achieve optimum performance with Longyear products.

Longyear specialists are also available to assist customers faced with unusual conditions that may require the development of new methods or equipment.

Operating from Canada, the United States, Chile, and Australia, Longyear's contract drilling divisions provide exploration drilling worldwide.

From the Arctic to the Antarctic ... and in much of the tundra, forest, jungle, desert and mountainous terrain in between, Longyear has dealt with every conceivable geological condition.

Longyear has developed internationally experienced, well-trained supervisors and operators and selects its teams carefully to match the particular logistics and drilling problems anticipated. It uses modern, well-maintained drilling equipment, and proven down-hole tools. Whether the application requires wireline core drilling, oil and gas exploration drilling, or reverse circulation chip sampling, Longyear crews maximize information recovery.

When Longyear is contracted to do drilling, the customer gets more than a drill crew; he gets the whole Longyear team. Foreman to fieldman, mechanic to metallurgist, all are backed by a century of service.

Longyear's drilling divisions have the people, the tools, and the technology.

Longyear provides geotechnical drilling services from many of its contracting centres.

Whether routine site investigation work, or sophisticated instrumentation and overcoring for rock stress measurements, it does it all. From San Francisco's Golden Gate Bridge to

Continued on Page 16

Underground Drill: widespread approval

The impressive achievements and widespread industry approval of Longyear's LM 37 Underground Diamond Drill are now well known.

Since the introduction of the LM Series, more than 100 drills have been sold throughout the world in countries ranging from Australia to Zambia.

Now Longyear is proud to announce the release of the new LM 45 Underground Drill — an outstanding addition to the LM Series.

The LM 45 drill is a result of Longyear's continual product review programme, designed to ensure maximum productivity and service for every one of its clients.

As a result, the LM 45 drill has a power pack significantly smaller than the LM 37, but which produces an increase in power output at the chuck. The LM 45 drill also benefits from a redesigned control panel, providing increased ease of operation, reduced operator fatigue and a safer work environment.

Each component of the LM 45 system has been designed for maximum productivity and reliability, with full compatibility for a wide range of options to suit every drilling requirement.

The LM 45 series drill heads are available in two capacities: a smaller unit which accommodates up to BQ size rods and core barrels, and a larger unit accommodating up to HQ size rods and core barrels.

Improvements in the feedframe components enable the LM 45 drill to offer the smoothest and fastest rod handling unit available today, and a range of other carefully designed features such as load sensing hydraulic circuits, hydraulic oil conditioning and fully integrated monitoring and trouble-shooting systems ensure efficiency and reliability possibly unequalled in other comparable drilling units.

The LM 45 Underground Drill is a superb addition to the renowned LM Series, and Longyear Australia is proud to offer the new LM 45 to its clients throughout the world.

Slim line well drilling

by R.O. Morris

PART 1

Definition

THIS paper considers onshore wells of 6" (152mm) or less, except for surface conductor pipe, and finishing at a maximum of 4" (100mm) and often less. Hole depth of not more than 2500m (1200ft) because this covers nearly 80% of all oil wells. The terms micro-drilling and ultra-small diameter drilling are also covered. Couple with the small hole sizes are minimal angular areas around both casing and drill pipe, often reducing by over 90% mud and cuttings volumes.

The main advantages

As important as the smaller sized holes is the fact that the whole operation is so much smaller, quieter and environmentally acceptable than those of conventional oil rigs. Drill sites can be less than 1200m² (0.3 acre), the rig plus all equipment and consumables weighs less than 200 tonnes and can move on 10 standard lorries or less. The volume of cuttings for disposal from a 2500m well is approximately 60 tonnes or 35m³. In comparison a conventional oil well would produce 700-1200 tonnes (400-700m³). If 85% of the slim hole is cored the cuttings are further reduced by 40-45%.

The drill mast is less than 20m (65ft) high and the crew is only 8-10 persons per 24 hours. Site acquisition, preparation and restoration costs can often be reduced by 60% + and drilling costs by 25-30%.

Essential facets of slim line drilling

For over 30 years, holes of 6" (152mm) and less have been drilled in some USA states for oil and gas to depths of 3000-5000ft (900-1500m). Such holes are often drilled by seismic and other similar 'light' rigs and they gave drilling cost savings of 10-30%. Whilst these are comparatively small diameter wells they are not what is meant by the current terms slim line, micro or ultra small diameter drilling.

Smaller diameter holes have greater wall stability and give increased support to the MINEX type drill string which rotate in these tight holes at 500-800 RPM. These speeds give some element of centripetal force and higher speeds considerably increase this straightening force. Many modern mineral drills operate at 2000 RPM and experiments are taking place to raise this to 10,000 RPM.

Experience shows that many cementing programmes can be satisfactorily completed on casing with a diametral clearance of 1" (25mm) or less, normal oilfield practice provides at least 3" (76mm) and often 6" (152mm). These smaller clearances mean that smaller holes will accommodate the same size of casing but they are drilled faster and require less mud and produce less cuttings.

There is a growing realisation that in some boreholes the casing can be drilled in with the aid of a diamond casing shoe, and that the circulation of cuttings plus the natural swell and sloughing of the strata will seal it in place. This is normal practice in mineral exploration and 7⅝" (199mm) casing is regularly placed in 7⅞" (200mm) boreholes, or 74.2mm (2¹⁵⁄₁₆") casing into 76.3mm (3") holes. These casings do not have all the necessary petroleum mechanical strengths but the above examples could be run to →

depths of 1500 and 1100m respectively (5290 and 3600ft) and they well illustrate the principle of minimal external clearances.

Of even more importance is the minimal clearance around the drill string in the uncased section of the borehole. In some recent years over 100 drilling rigs have been working in South Africa putting down holes to 3000m and deeper (10,000ft) for gold exploration. The common final hole size is a nominal 3" (75.8mm) run on a core barrel of 2⅞" (73mm) OD which is run on wire line drill rods of 2¾" (69.8mm) OD. In 1986 one such hole was drilled to 5422m (17,785ft). In the latest thin walled wire line designs a 3" (75.8mm) hole can be drilled to over 1000m (3300ft) on drill rods of 2⅞" (73.0mm) OD i.e. only 1.4mm (0.055") clearance per side.

It is not suggested that these sizes and clearances are directly applicable to oil drilling where operating and drilling requirements are very different, but they are common practice for drilling millions of feet/metres every year and are quoted as an illustration of what is being done daily by one sector of the drilling industry.

Much mineral drilling is in the harder metamorphic and igneous rocks where the oil industry normally stops, but tens of thousands of metres are drilled annually for coal, potash, salt and gypsum etc. in exactly the same Jurassic, Triassic, Permian and Carboniferous formations that attract petroleum geologists and drillers.

A very major benefit of these small annular clearances is the very small volumes of flushing fluid required, an impregnated diamond core bit can be adequately cooled, cleared and the whole borehole flushed on two gallons (9lb) per minute. Often it is just plain water but polymers are being increasingly added to reduce friction, improve cooling and cleaning, improve cuttings removal, to reduce circulation losses and prevent swelling of clays and man????? causing tight hole problems.

The greatest single benefit of slim hole drilling is the inherent stability of small diameter holes — small holes are stable holes. Just as the strength of a rock core is proportional to the square of its diameter to the stability of the borehole wall increases with decreasing size. Stable holes need less casing and some production holes can be left uncased — barefoot — over the production zone.

Slim line drilling is not just a matter of merely drilling smaller diameter holes, it also requires a totally new approach to the construction of the well and a new concept of how to drill the hole. It should also include modern automated machines which eliminate so much of the hard physical graft and allow the driller to concentrate on making holes safely, rapidly and cheaply by giving him all the necessary data and controls at his finger tips.

Review of some slim line oil well drilling

(a) Canada

In the mid 1970s the new Heath and Sherwood HS 150 drill was developed for drilling slim holes in remote areas. It was light weight and easily transported by helicopter. The derrick is a self-erecting cantilever design giving 18m (60ft) stands and 104 tons rating. It is designed to withstand winds of 120mph without any guy lines.

A series of about 12 wells were drilled for Challenger Oil, over 60,000ft (13,300m) were successfully drilled and the deepest well was nearly 8000ft (2440m). The drilling was a total success but no productive oil or gas was found.

The HS 150 rig has since been moved to South Africa and is now made there under licence. One of these rigs operated by Universal H.S. Drillers drilled to 5422.7m (17,792ft) in 1986 using their special aluminium wire-line drill rods.

Two sizes of aluminium rod were used Super H and Super N giving nominal 4" (102mm) and 3" (76mm) holes respectively and cutting 1⅞" (47.6mm) and 1 15/16" (36.4mm) cores. These rods have special alloy-steel couplings but still give a marked saving in weight, in water the N size rods weigh only 3.3kg/m (4.9lb/ft) compared to 7.4kg/m (11lb/ft) for a comparable steel rod.

Because aluminium rods wear rapidly under compression a bottom section of heavy gauge steel rods was run to provide the necessary bit weight and the aluminium string was always in tension, about 300m (985ft) of steel 'leader' rods were usually sufficient.

By cutting only an N size core in an H size drill string, and similarly a B core in an N string, a much larger internal annulus is created and this permits pulling speeds of up to 180 m/minute (590ft/mm) when recovering the inner core barrel. This is more than double the speed possible when using standard steel rods. A wire-liner inner barrel round trip from 5000m (16,500) took less than one hour.

(b) Sweden

In 1974 the Swedish oil exploration group OPAB started a drilling programme on a series of sedimentary structures in southern Sweden. Small oil fields were found on the island of Gotland but production was too low to justify the cost of drilling using a conventional Cabot Franks Type 300 rig which weighed 36 tonnes and had a mast height of 30m (98ft).

A modern all hydraulic mining drill, the Craelius DIAMEC 700, was tried and after some initial problems a satisfactory technique was developed for drilling 51mm (2") wells to 500m (1640ft). This hole diameter was later increased to 61mm (2.4") and the larger DIAMEC 1000 drill has since been modified by Microdrill TGB. Between 1977 and 1983 over 90 wells were drilled on Gotland using this equipment and 19 producing wells have been completed.

Drilling comparison table

	Cabot Franks 300	DIAMEC 700
Weight of rig (tonnes)	36	6
Mast height (m)	30	6.5
Pulling capacity (tonnes)	100	3.6
Hole diameter (mm)	159	51/61
Wt of drill pipe (kg/m)	14	4.8
Drilling mud on surface m^3	22	2.25
Number in drill crew	4	2
Typical cost 500m well SKR	820,000	235,000

Drilling costs were reduced by 75% and the two man drill crew took on most of the jobs previously done by specialist contractors such as cementing and casing, core sampling and acid treatment. Moving and setting up is so much quicker, easier and cheaper with these light units and the site has many environmental advantages.

Under the management of T.G.B. Microdrill A.B. of Gothenburg Sweden overseas companies have been formed in Europe and Central America and several thousand wells have been successfully completed. In fact the company name of Microdrill is now used as the general term for drilling the smallest diameter wells to 1500m.

(c) UK

In 1986 a Microdrill MD-3 rig completed a 6-hole programme near Earking for BP Exploration, one well was for exploration, two for appraisal and three development wells.

Four were vertical and the other two directional with a maximum of 36° off vertical and a depth of 3531ft (1075m).

Whilst some BP engineers had reservations about the programme and especially over the wellbore/mud hydraulics in general the results were satisfactory and proved many of the potential cost savings. Site acquisition, preparation and rigging up and down showed savings of 60-70%. Drilling consumable costs such as bits, mids, chemicals, cement, fuel oil and waste disposal all showed reductions of at leat 50%.

The BP geologists and geophysicists were very pleased with the quality and detail obtained from the logging suites run by BPB of Loughborough in the holes cased off with 2.91"x2.64" (74mmx67mm) casing.

The uniform size of the borehole and the lack of any washouts, the close fit →

of the logging instruments in the hole and the thin and uniform steel wall of the casing all helped to give logs of great clarity and detail with virtually no correction or adjustment.

(d) USA

In the mid 1980s Gulf Research and Development Co (Chevron) in co-operation with Longyear Co drilled two stratigraphic wells in Texas which required a continuous coring technique. Using the Longyear HD600 fully hydraulic rig over 11,000ft (3350m) of core were recovered at over 99.8% recovery.

After setting conducting casing to 31ft (9.5m) a 9⅞" hole (250mm) was drilled to 920ft (280m) and 7⅝" casing (194mm) was cemented in the fitted with a B.O.P. The 9⅞" hole was drilled with rock roller bits plus collars and stabilisers and all run on the CHD 101mm heavy duty wire-line rods (94x78.5mm). A 5½" (140mm) flush joint casing was set inside the 7⅝" casing to stabilise the CHD 101 drill string and to give higher uphole mud velocities. This wire line system is rated to 10,200ft (3100m) and gives a core of 2½" (63.5mm), hole size varies between 3.99-4.375" (101.3-111.1mm) dependent upon hole and rill fluid requirements. Core barrel length was up to 40ft (12.3m).

The HD 600 is an all hydraulic rig with accurate feed controls to give a constant weight on bit (WOB). Hydrostatic drive gives rotary speeds from 15-20 RPM for rock bits up to 950 RPM for smaller diameter coring. The unit is powered by a 200HP (150kW) diesel engine, the mast height of 58ft (17.7m) gives a 40ft (12.2m) pull. The crown block is rated to 100,000lbf (45,350kgf) and the hydraulics give 60,000lbf pull (27,200kgf) twin hydraulic rams give an 11ft (3.3m) feed stroke but an hexagonal top drive adaptor can give up to 20ft (6m) stroke.

Fresh water with polymers was used for the initial drilling but intersecting anhydrite and halite made a change to a saturated brine/polymer fluid essential. Cuttings from the diamond core bit had over 95% smaller than 75 micron (200 mesh), those were removed in a settling pit plus a 3 cone desitter.

The holes were later logged with a Schlumberger 3⅝" (92mm) probe and calliper logs showed very little washout. Drill stem and packet tests were carried out. The BOP stack fitted to the 7⅝" casing include an annular preventer and pipe rams and a blind ram, all other normal petroleum safety operations and practice were fully observed.

(e) USA

Dr Keith Millheim of AMOCO Tulsa Research Centre Oklahoma has also been operating the H.D. 600 rig and CHD wire line coring. The intention of this operation is to drill fully cored holes and to log and analyse all core on site. Within three hours of the core being pulled it can be fully logged and over 40 analyses and parameters recorded, over 400ft (120m) can be cored and logged per 24 hours. To speed up coring AMOCO have extended the core barrel and in suitable formations cores of 80ft (24m) can be pulled and they hope to increase this length.

AMOCO mainly use the CHD 101mm core system and if necessary they will retrieve the inner tube assembly and leave the outer tube plus all the rod string in situ in the hole to act as casing or production tubing.

To increase drilling automation and to provide better data control and recording AMOCO took delivery of the latest model of the Diamant Boart DBH 1500s drill rig in 1988. The special feature of this particular rig is that it is fitted with a totally automatic pipe handling system operated by the driller from his control console and the pipe is not handled by any of the drill crew. A 6m (20ft) drill rod can be picked up from the horizontal storage rack, raised vertically and fed into the automatic chuck which makes up the thread to a pre-set torque all in less than 30 seconds. The time taken is very similar whether running in or pulling out the hole.

Approximately 2500ft (765m) of drill pipe can be run in or pulled every hour with absolute safety for the drill crew who do not need to be anywhere near the pipe. It is also far kinder to the threads which are made up and broken under strictly controlled pre-set torques. 2500ft of pipe per hour may not be very rapid by petroleum standards but the pipe need never be stacked in the mast and is always stored in stillages which are easily ready for loading on and off trucks.

(f) West Germany 1987 — continuing

Whilst the K.T.B. — German continental deep drilling programme — is a research project and has no direct connection with slim line oil drilling it has proven a new 6" x 3¾" (152 x 94mm) wire-line core barrel and rods to nearly 5000m (16,400ft) in extremely hard metamorphic and igneous rocks. This test hole was drilled with an elderly oil rig converted to top drive to turn the impregnated core bits at 300 RPM, the bits averaged 80m (260ft) at a penetration rate of 23m (75ft) per hour, WOB was 3 tonnes and a mud with special additives to withstand inhole temperatures and togive better cooling and cleaning to the bit face was pumped at 220 l/min (48 galls) at 70 bar (1030 psi or 73kg/cm²). The wire line rod OD is 5½" (139.7mm).

This 5000m is the baby pilot hole to help in developing techniques for the nearby stratigraphic hole to 14,000m (46,000ft). A totally new top drive rig standing 80m (260ft) high and with 8000kW (10,730hp) of installed power is being developed. This deep hole should start in 1990 and drilling is expected to finish in '97, but this time includes hundreds of interruptions whilst a whole range of in-hole testing and research is carried out.

(g) UK Highland Slimfield

Because the writer has some direct personal knowledge of this operation it will be covered in more detail and used to illustrate some of the basic factors which are critical to slim line drilling.

Highland Slimfield Ltd. was formed in 1986 to develop a drilling unit capable of drilling Ultra small diameter (USDD) holes to 1500-1800mm. The whole unit was to be compact, light weight, easily moved and quiet. Financial management came from Pentex Oil. Mr Richard Braithwaite was appointed managing director, after several years with BP he had formedd his own mineral exploration company in 1972 — Encore Drilling Co. Ltd., which always used the latest Swedish semi-automatic drill rigs and their thin walled in-hole equipment. Thus he had a rather unique range of experience well suited to bringing MINEX technology into oil field practice.

Diamant Boart in Belgium had developed a range of all hydraulic long-stroke and automatic feed/pull drills and on their largest model the DBH 1500 they added a microprocessor unit which controlled, monitored and displayed all the critical rig functions plus those from some of the ancillary equipment; a 10 track disc recorded and printed out this data in real time on the rig computer.

Highland Slimfield designed and fabricated an ingenuous self elevating two level structure with the drill and all controls under cover on the upper level and the complete mud pumping, cementing and mud mixing/treatment package on the lower level, the whole sub-frame could be hydraulic raised up to 1.6m (5ft) over the well head.

Because of immediate contract start up, and the urgent need for income, the rig went to drill for Tullow Oil (Dublin) at Timahoe in Eire late in 1987. The drill site had been prepared, a cellar formed and a conductor pipe grouted in. The complete rig unit moved from Scotland on seven trucks and 16 hours after arriving on site they started drilling. At 190m (625ft) they set HX casing (114x105mm) to seal off a lost circulation zone at 164m (538ft) this casing was substandard and would not give the necessry press-

Continued on Page 22

Where the Sand Goes: Or When Will the Other Shoe Fall?

By Jay H. Lehr

Have you ever wondered why so many wells that sand-up don't fill up with sand? I'm speaking, of course, about those damn nuisance wells that require an in-well pump protection sand separator to extend the life of the submersible or turbine pump.

For more than a decade now, since in-well sand separators have been in common use, people have been worried; if the well pumped a couple of coffee cans full of sand every day before the separator was installed, why didn't that sand eventually fill up the well once it was no longer being sucked through the pump? Why didn't the separator and pump eventually suffocate itself by means of its own power to draw sand through a formation until it virtually buried itself in grit? ("A little bit of sand" can actually be quite a lot. For example, a concentration of 25 ppm of sand in a flow rate of 100 gpm will produce 1,000 pounds of sand every 500 hours of operation.) Experience long ago taught me to tell them with a twinkle in my eye, "not to worry, it may never fill up." Now, after two and one-half years of research, I am convinced that nine times out of 10, I'm right.

How nerve-wracking it must be for these well owners and drillers to wait for the other shoe to fall, never knowing when the well will fill but certain that it will. Yet it never seems to happen.

"Let me try to put all you restless drillers at peace with your wells and sand separators."

I have looked at situations across the country afflicted with this dilemma, and the story is commonly the same. No amount of development appears to end the constant stream of sand appearing in the water.

With little confidence, desire or money to drill a new well, owners and drillers decide to live with the problem and install a sand separator in the well at the suction of their turbine or submersible pump. They hope they can get a few good years of service out of this ornery hole in the ground. And even if they know the pump will now last longer, and produce sand-free water, they know intuitively that they have merely replaced one problem with another. The well is sure to fill up with sand!

Yet, plumbing the well depth initially and then a significant time (six months to a year) later finds only a few feet of sand in the well bottom, lessening its effective depth a little. Another six months or a year later, driller and owner alike are surprised to find the depth about the same. The conscientious home owner or driller may on occasion of periodic maintenance, pull the pump, clean out the sand and re-install the pump. More often than not, but not always, the well will again fill up with sand to the pre-maintenance level but not further and, again, driller and home owner wait for the seemingly inevitable to happen—but it doesn't. When a well does not refill, it is generally because at long last, over time, the well did develop a clean envelope of coarse sand around it.

Let me now try to put all you restless drillers and well owners at peace with your wells and sand separators, calming your anxiety so that you may direct your nervous energy elsewhere.

You see, it takes the energy inherent in flowing water to carry sand into a well. When a well is first drilled, its screened or open area is capable of letting in a maximum amount of water. That water can →

carry in a maximum amount of sand as shown in Figure 1. The flow path for each particle of water is the shortest relative distance in the saturated zone of influence around the well. Thus, the water suffers the least energy loss in moving through the aquifer, enabling it to use excess energy to carry sand through this devilish formation whose sorting characteristics won't allow the development of a clean, coarse sand envelope we love to grow around our wells.

But all is not lost. If we give nature a chance, she will most often work in our behalf if only we "go with the flow" and do not choose to fight her (like when we build dams, straighten rivers, build homes hanging over soft hillsides, block recharge areas and so on and so on). In sanding wells, as shown in Figure 2, when the separator purges enough sand into the well to fill it with the right amount of sand, the flow patterns in the zone of influence around the well are no longer efficient and orderly but, instead are tortuous and elongated. As with all inefficient things, energy is lost—but in this case, for a change, that energy loss works in our favor. It is just that loss of energy that makes it difficult for the water entering the well to carry any more sand with it. Thus, the very fact that the pump protection separator has caused a controlled sand buildup in the well establishes an impediment to continued sanding of the well. If this were not the case, the result would always be ultimate self-destruction (with or without a sand separator).

In the situation in Figure 2, the sand separator will continue to recycle the sand in the well in a virtual never-ending cycle. The separator is still necessary. Without it the pump impeller, bowls, shaft, or bearing wear would cause decreased pump efficiency, as well as increased energy consumption. Be- →

Technology Vital

The announcement by the Minister of Education that technology will be introduced as a new subject in the proposed curriculum for secondary schools is a much needed initiative, according to the Chief Executive of the Institute of Professional Engineers New Zealand, Armour Mitchell.

"Professional engineers welcome the introduction of technology studies and the linking together of science and environment as one subject," he said in response to the Minister's statement on the restructuring of the curriculum.

"However, professional engineers are disappointed that the Minister does not see the technology curriculum being implemented before 1995."

The Institution believes that a sound base for the development of technology is vital for providing employment and enabling social goals to be achieved.

IPENZ is keen to see a new focus on technology which has tended to be a poor misunderstood relation in the trio of science, research and technology.

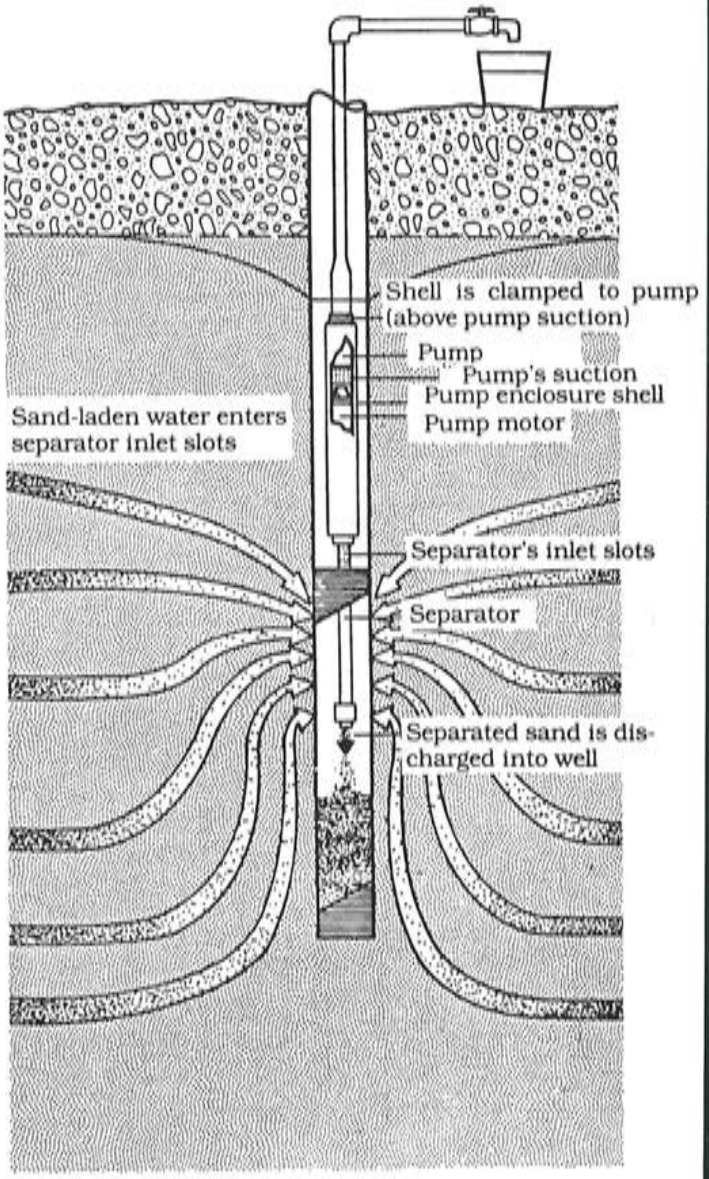


Figure 2. When the separator purges enough sand into the well, the flow patterns change, making it difficult for water entering the well to carry sand.

sides if the separator were removed from the well, the sand would go up through the pump, upsetting the equilibrium existing in the well, reducing the inefficiency outside the well, and increasing the energy available to carry more sand into the well to replace that which is pumped out. Therefore, instead of reaching equilibrium with a fixed volume of sand in the well (and no more movement through the formation outside the well), we would have a continuous movement of sand into the well and up the pump.

"No amount of development appears to end the constant stream of sand appearing in the water."

So hang on to the separator, don't worry about the reduced depth of your well, and thank Mother Nature for an almost free lunch. (Remember floods, pestilence, drought damage, etc. are not a result of Mother Nature working alone; man is part of the equation that results in havoc.) Here Mother Nature and pump protection separators combine to help us solve a knotty problem. We have only to understand the strange way they work as shown in Figure 3. Actually, it is basic physics of flow through porous media—nothing really mysterious about ground water flow—and a unique form of the hydrocyclone that does the trick.

If per chance you know of a well where the other shoe did drop, here is why:

- The distance between the depth of the pump setting and the bottom of the well was not great enough to allow adequate sand buildup to reduce ground water flow energy. In turn, the water's sand-carrying capacity was never reduced enough to set up the equilibrium. If room allows, this can be remedied by raising the level at which the pump intake is set in the well. There are occasions where adequate depth does not exist.

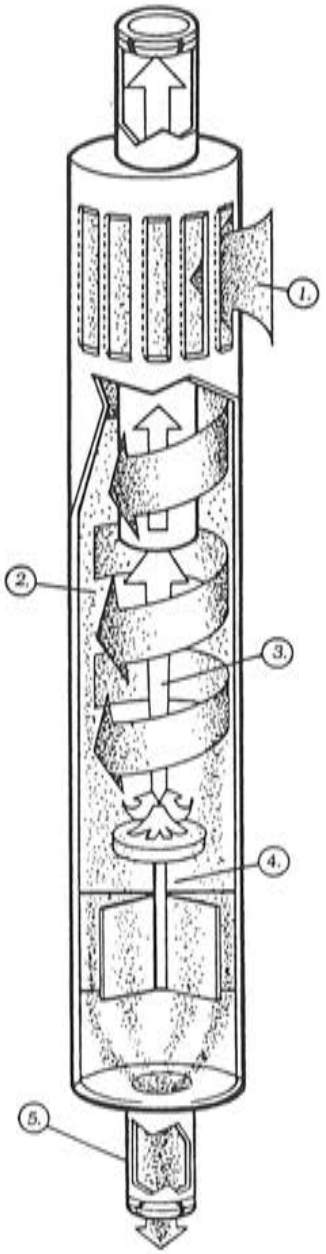


Figure 3. Mother Nature and the sand separator combine to help us solve the problem, as shown here.

1. Sandy water is drawn through tangential inlet slots into separation chamber.

2. Sand is centrifugally separated from water and tossed to perimeter of chamber.

3. Sand-free water is drawn to center of separator and up through vortex outlet to pump's enclosure shell.

4. Sand particles fall downward, along perimeter, to bottom of separator.

5. Sand is purged, via tail pipe, into bottom of well.

- There may be some situations where the high permeability of the aquifer (whose sorting characteristics produce sand) is so great that no amount of sand buildup in the well will reduce the energy of the water to carry more sand into the well. In this case, the problem can be solved in one of two ways:

1. Dramatically reduce the flow rate and subsequent drawdown till the yield is the minimum necessary for use. Such highly permeable formations usually have an extremely high specific capacity, making possible a reduction in hydraulic gradient outside the well that will thwart sand movement. Here, a separator may be needed to further reduce the energy of the flowing water via sand buildup in the well, as well as to eliminate any sand or grit that might damage the pump.

2. Such high-yield wells can also be lined with a screen and sand pack that will act as a filter to physically block the entry of sand. A drop of 40 to 60 percent in specific capacity can be expected, but the high-yielding characteristics of the aquifer, which posed the problem with using the sand separator may still produce acceptable amounts of water.

It is important to point out here that a large percentage of our sand-producing wells are not entirely due to irrevocable geologic conditions but are the result of poor well design, construction and development. Our first line of defense is to be sure the job is done correctly and preclude the need for a sand separator; failing this, however, it's great to know that nature and the pump protection separator can limit our losses and keep our wells operating for a long and useful life. ■

LM22 makes fast entry into 'one-man' operation market

LONGYEAR Australia has expanded its LM drill range with the introduction of the LM22, a light, compact underground drilling system designed with one-man operation in mind.

Capable of being used in a broad range of underground applications, the LM22 is said to be particularly suited to up-hole operation.

It can be used for shallow ore blocking, grade control and exploration drilling.

The unit features lightweight aluminium construction for easy access in confined locations and two important innovations.

The first is a twin motor rod rolling assembly which enables rods to be handled without the limitations of carriage feed stroke length. This significantly reduces wear on carriage guides and feed components.

The second innovation is a thread breakout system which automatically breaks tool joints by applying torque reverse rotation to quickly unscrew rods as they emerge from the hole.

With the rod roller, this makes the LM22 highly productive by reducing rod tripping time and hence freeing up time for actual drilling.

The first two drills off the assembly line have been sold to Western Mining Corporation's Kambalda nickel operations, near Kalgoorlie in WA, and MIM Holdings' Hilton mine, near Mt Isa in Queensland.

Kambalda drilling superintendent Mick Lanfranchi said several favourable aspects of the LM22's performance had been highlighted during trials.

"Improved safety margins when drilling steep up-holes, a measurable increase in drilling production, superior rod-holding capability, and the LM22's ability to operate in mines where conventional screw feed drills would not have had enough air," he said.

"The LM22 is a valuable addition to our drilling capabilities."

Hilton production foreman Tom Philip was similarly impressed.

He said the rig's light weight — it could be moved by two men — had meant fast drilling of holes at 5m centres.

"The drillers also appreciated the hydraulically driven rollers and sequenced rod handling which quickened rod handling on a number of longer up-holes," Philip said.

"The LM22 performed its task of drilling orebody delincation holes extremely well and it will be a valuable addition to our fleet."

Following its Australian release last month, the LM22 is to be released worldwide next month and strong export sales are anticipated in Canada, the United States, Mexico, Chile and Central Europe.

Commitment to research

Longyear Australia continues to benefit from the long-running commitment to research and development inbred by its 100-year-old parent.

From humble beginnings as a contractor drilling for iron ore in Minnesota's Mesabi Ranges in 1890, the Longyear Group has undergone rapid worldwide expansion.

Adelaide-based Longyear Australia's extensive product review programme recently yielded the LM45 Underground Drill, a progression from its successful LM37 unit.

A company spokesman said the new drill had an increase in power output at the chuck, with a redesigned control panel enhancing the ease of operation and reducing operator fatigue.

"Each component of the LM45 system has been designed for maximum productivity and reliability, with full compatibility for a wide range of options to suit every drilling requirement," the spokesperson said.

Another unit to benefit from extensive refinement is the LMP850 Multi-purpose drill.

The LMP850 can be truck or crawler mounted and has been designed to perform a variety of drilling functions, from diamond coring and reverse circulation to open hole rotary percussion and rotary mud and auger.

Longyear Australia is currently developing and manufacturing a range of Poly Crystalline Diamond oilfield bits.

The company is a world leader in the production of impregnated diamond coring bits for the metalliferous mining and exploration industries.

Continued from Page 9

Toronto's CN Tower, there are civil works around the globe that incorporate Longyear workmanship.

Longyear is in the forefront of the global effort to control the adverse environmental impact of economic development. It routinely installs monitoring wells and provides other geoscientific instrumentation to detect pollution sources. The information obtained by these methods is used in developing vital environmental protection strategies.

Longyear says its people are the reason it continues to enjoy success.

It strives to provide a stimulating environment in which Longyear people can develop their careers and expand their horizons, both geographically and professionally.

Longyear says it invests in training programmes on the job and through formal academic courses.

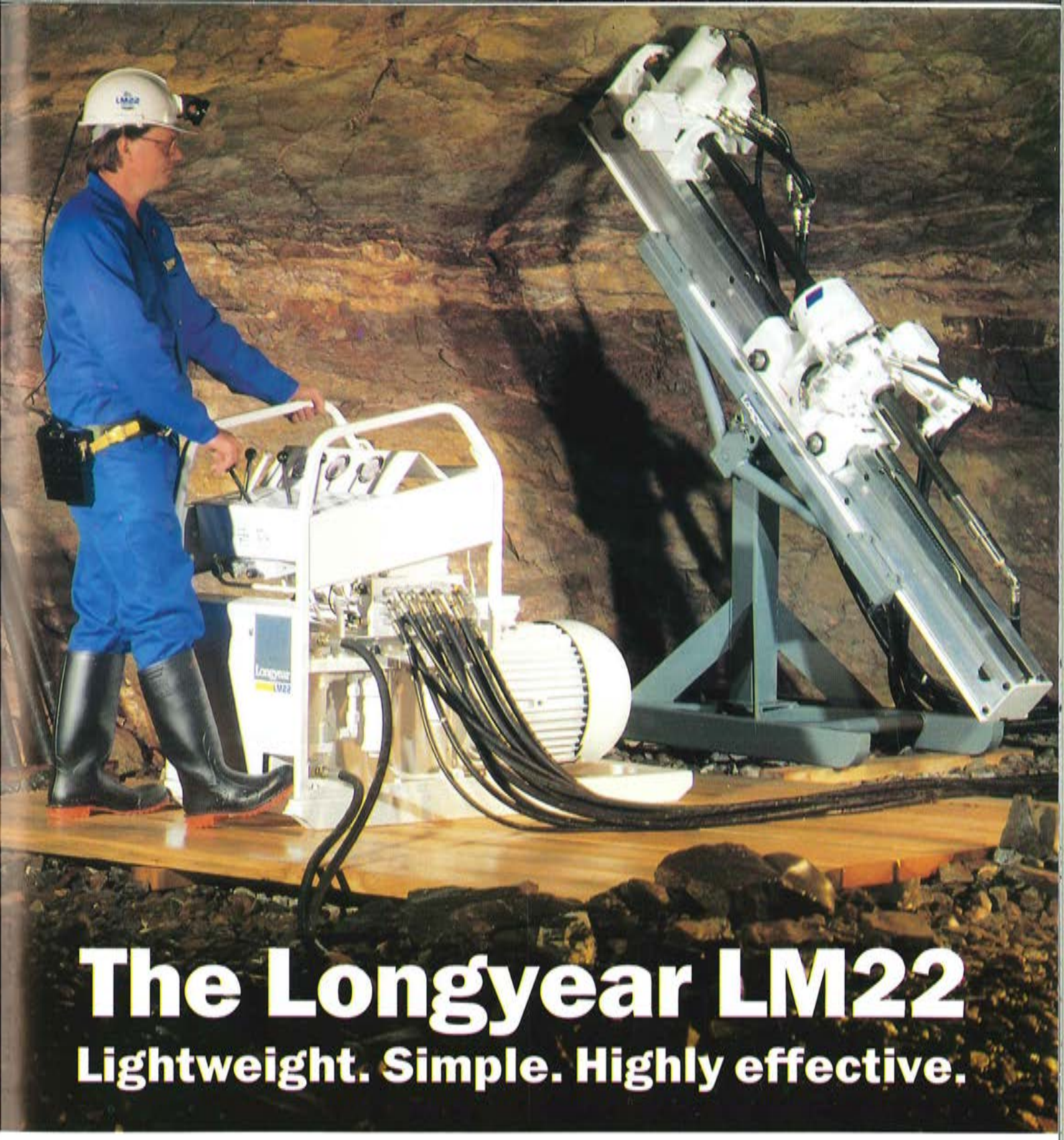
Employee benefit programs are designed to ensure Longyear people can concentrate on their assignments with minimum concerns over external issues.

with exceptional long-term loyalty from its talented people.

If you are engaged in exploration of the earth's crust and require accurate sub-surface samples, Longyear says it will help you get that vital information, economically, and on time.

Longyear says it will do the drilling for you, or furnish the tools for your crews.

And Longyear says it is ready to go to work for you, anywhere in the world, whenever it is needed.



The Longyear LM22

Lightweight. Simple. Highly effective.

The Longyear LM22 Diamond Core Drill system is a new, compact, lightweight underground drill designed with improved productivity and simplicity in mind.

Featuring fast, automatic sequenced rod handling using a combined rod roller, rod clamp and breakout device, the LM22 drill incorporates a fully integrated, ergonomically-designed control panel and uncomplicated hydraulic circuitry for low maintenance and reliability.

With a high output drive head, compact design and simple, rugged construction, the LM22 is a remarkably low cost investment offering improved operator safety and significant advantages over conventional air driven screw feed drills, particularly in up-hole drilling applications.

Longyear
LM22

For further information contact Longyear Australia Pty Ltd.
919-929 Marion Road, Mitchell Park, South Australia 5043. Telephone (08) 296 6022 Telex AA 82421 Fax (08) 377 0534

TECHNOLOGY

Central — not marginal to future

The recently released Porter Report has sent a strong message to Government on the need for technology education and innovation to provide the lead for economic recovery.

This reflects the concern expressed by keynote speakers at the Institution of Professional Engineers New Zealand Conference in February about New Zealand's economic performance and technological solutions for sustainable development.

In welcoming the findings of the Porter report, IPENZ President, Alan Bickers, said it was a comprehensive analysis of New Zealand's economic malaise, providing some positive approaches to restoring this country's competitive leadership.

The Institution has formally asked to be included in the Prime Minister's sector group conference on the report early in May.

"Engineering technology is one aspect that must become central, rather than marginal, to the planning and implementation of Government and business strategy," said Mr Bickers.

"The low proportion of professional engineers as directors or leaders of New Zealand business is a marked contrast to what prevails in Japan, Germany and other successful trading nations."

New Zealand's international ranking in the number of citizens with educational and vocational skills is extremely low and IPENZ has long recognised this as a serious problem.

"The Report has suggested some essential and dramatic alteration to the way New Zealand does business, but these will not take place until education becomes more orientated to support economic activity," said Mr Bickers.

"Until these shortcomings start to be corrected, this country can forget about becoming a leading and innovative international trader once more."

The 1991 IPENZ Conference theme of "Choosing the Future" led keynote speakers to focus on the need for economic development and productivity in New Zealand.

Both the outgoing President of IPENZ, Barry Butcher and the Chief Executive of IEAust, Bill Rourke, challenged engineers to use their knowledge and skills to address the problems of the economy with technology and innovative approaches.

In his speech Mr Butcher urged professional engineers to become more visionary in their approach.

"With the accelerating change in technology and social values, it is necessary to make an assessment of future values and needs for both the short and the long term developments that we are planning," he said.

Mr Butcher said that New Zealand must become a clever country. Scientific and engineering education should be directed towards high technology and become integrated with the needs of industry.

"To date our manufacturing sector has not been successful in creating jobs in the new high technology and export orientated businesses," he said.

Government should be providing incentives to encourage increased research and development investment."

New Zealand faces a future of increasing change. Technology changes will demand flexibility to be built into engineering solutions as obsolescence will come increasingly quickly. There will be a complimentary need for a highly skilled, flexible workforce. Employment will be on a contract basis and productivity will be the key parameter for performance measurement.

"To compete with the rest of the world we must become more productive, more quality and service conscious and be more responsive to what the markets and the customers want," he said.

Education will be a key to this responsiveness. A labour force with high skill levels will be more adaptable and innovative and will create a stronger, faster growing economy.

However, Mr Butcher pointed out that for New Zealand productivity on its own will not be enough. There is a need for co-operative development with Australia and other Pacific neighbours. By combining strengths and establishing shared policies for international trade, defence, currency, business law, research and development we can enhance our international competitiveness.

Mr Butcher believes the key to the successful engineering of future developments will be to anticipate change. Engineers need to be sensitive to and provide solutions that match changing social and cultural values.

Environmental values are a prime responsibility and the challenge to engineers is to take a lead in employing technologies that enable sustainable development.

"No issue deserves a greater effort from engineers than meeting the challenge of interlocking development and the environment," Mr Butcher said.

Mr Butcher closed his address with the observation that for too long New Zealand has been like Dickens' Mr Micawber — "waiting for something to turn up".

"It is time we realised that only drive, dedication and hard work will make it turn up," he said.

"I believe that for engineers the challenge of the future lies in using wider skills to make New Zealand strong again."

Bill Rourke, Chief Executive of the Institution of Engineers Australia, also expressed concern about the economic welfare of both New Zealand and Australia. He presented the 22nd Newnham lecture, "Engineering our Common Future", at the Conference and spoke of the contribution engineers can make in determining the future to achieve the results society wants.

"I do not think there would be much argument with the view that we must adopt policies of sustainable development with the aim of significant and sustainable improvements in our economic welfare," he said.

To achieve an improved economy, there is a need to improve our productivity and competitiveness.

"More than anything else, we have to create a climate where we are intolerant of inefficiency, poor quality and overmanning, and where we encourage the elimination of bad practice and outdated technology," said Mr Rourke.

The overriding community need is to work towards becoming a country whose assets are the skills and abilities of its people. Mr Rourke said that engineers must be informed on productivity concepts and encourage the development of productivity measurement and analysis. Engineers must regard innovation, product development and productivity development as part of their daily task.

He said education is the key to keeping abreast of new technologies and to learn new skills. Mr Rourke called for engineers to extend their interest and involvement to the higher technician and para-professional levels of the profession. Neither New Zealand nor Australia is performing well in this area and apprenticeship enrolment is well below that of other OECD nations. →

"We must persuade the community that technology, and the engineers that apply it, can provide the key to successful sustainable development and to treating the environment with care," said Mr Rourke.

Environment and development issues are inseparable and engineers have a crucial role in the protection of the environment through the provision of professional advice to all sectors of the community.

"My message is largely conventional wisdom," he said.

"The concern is that we have been too slow to identify the problem and too slow to react to it. It is up to us to put engineers at the forefront of necessary reform," Mr Rourke said.

He called for a Transtasman partnership between IPENZ and IEAust as a means to maintain high common standards of professional engineering qualifications, eliminate barriers to mutual recognition and develop joint policies.

letters

Mr Mel Ouston
Secretary
NZ Drillers Federation Inc.
P.O. Box 102
HUNTLY

Dear Mel

With the July Drillers Conference soon to be held, I need to remind the NZDF, as I did at the last conference, that a lack of drilling student numbers (working students in particular), is now putting this course at risk of being withdrawn.

At present we only have five students and only two of these are sending work in.

Drillers, on average, have never been overenthusiastic in doing lessons, but we have understood their working long hours and being away from home, entitled them to some special consideration. We have until now, been able to roll over their enrolments to allow them to take 2 or 3 years to complete the course. Larger enrolled numbers helped us to do this.

But times have changed. Accountability is the "in word". Everything about our courses is now being recorded on the computer. Uneconomcial class numbers are immediately recognised and questions asked on why we should continue teaching them. I have already given some reasons to keep Drilling, but it doesn't really stand up to scrutiny by others.

If TOP's Council does recommend giving up Drilling, I believe the final say on whether it can be dropped or not, will rest with the Ministry of Education.

Rest assured, that I will do what I can to try and keep this course alive. If it goes, so will the NZQA Drilling Practice Examination and none of us wants that to happen.

Yours sincerely
Dave Fisher
Supervisor
Faculty of Engineering Technology

● On June 6 Dave Fisher wrote:

It's too early to give you reliable information where the Drilling course stands just now, as our academic committee is still looking at it and several other "so called" uneconomical courses.

I do know that some committee members favour fighting to keep Drilling, as it costs this polytechnic very little to run seeing as drillers work from a textbook.

The problem that is coming up however, is not just the cost of running the course, but what the NZ Qualifications Authority might require of us. The NZQA took over the functions of the NZ Trades Certification Board and have an "accreditation policy" that might prove difficult to meet.
Dave Fisher

After 100 years has Longyear gone soft?

Ours is a tough industry, no question. But at Longyear Australia we've always recognised the importance of the human element, the need for co-operation, partnership and mutual respect.

It's been a vital element in the Longyear success story over the past 100 years. In fact, we're going even further in this our centenary year.

We are proud to announce the Longyear Australia Foundation, which is designed to provide financial assistance for scientific and medical research that will benefit all Australians.

Longyear

Our first grant recipient is the Sydney-based Skin Bank. Funding from the Longyear Australia Foundation will enable the world-acclaimed Skin Bank to extend its pioneering work in cultivating human skin cultures for the treatment of severe burn injuries, skin cancers and other diseases.

These revolutionary advances will benefit all future generations of Australians. One day they may even benefit someone you know, one of your workmates or a family member. And if you think that's soft, it's all right with us.

WLA.01.07

Partial vacuum to increase well yield

By David Goodrich

Well Notes

About 29 per cent of the US population depends upon septic tanks or cesspools for the disposal of domestic wastes and other kinds of local wastes associated with farms.

Source: NWWA Information Resources Department

THE successful performance of many ground water development and remediation projects depends on achieving a maximisation of ground water withdrawal capability through careful well design, construction and development.

Beyond these measures, the yields of many wells can be increased even further by the deliberate establishment of a partial vacuum in the air space above the pumping water level at the centre of the well.

The establishment of the partial vacuum takes place when the static water level within the well is lowered by pumping activity and air is not allowed to enter the well from the outside. The well head must be airtight and the well must be constructed in such a fashion that air cannot find its way into the innermost portion of the well. If air is prevented from entering the well through the well head, outer casing, and well screen, the air pressure will be lowered as the water level falls, creating a partial vacuum. The lowering of the air pressure in the space above the pumping water level serves to draw additional ground water into the well, increasing the entrance velocities and improving the specific capacity.

"The vacuum is strongest and most effective when the static water level is high above the pumping water level."

The maximum potential strength of the vacuum may be estimated by the following procedure. The vertical distance between the top of the well and the pump intake is divided into the vertical distance between the static water level and the top of the well. The resulting fraction is multiplied by 14.7 and then subtracted from 14.7 to give a negative pressure in pounds per square inch. Since this maximum potential strength is seldom achieved, a more practical estimate of the vacuum's strength can be made by using a modified fraction. This fraction results from dividing the vertical distance between the top of the well and the pumping water level into the vertical distance between the static water level and the top of the well.

The vacuum is strongest and most effective when the static water level is high above the pumping water level and there is little distance (air space) between the static water level and the top of the well. The vacuum condition can be diminished if the pumping water level falls below the top of the well screen, thus drawing in soil gas or air from the gravel pack. It can also be reduced if the ground water contains suspended or dissolved gaseous substances which become liberated by the turbulence caused when pumping.

The establishment of a partial vacuum to enhance well yield and remove volatile organic compounds has found wide application in certain types of corrective action systems. Some remediation projects involve the interception of contaminant plumes and the increased yield caused by the vacuum can serve to enlarge the area affected by the cone of depression and increase the effectiveness of the system. In some applications, vacuum pumps have been used at the well heads to maintain and increase the lowered pressure within the wells.

GOULDS PUMPS IN NEW ZEALAND

LAST year Brown Brothers Engineers Limited were appointed sole New Zealand distributors for Goulds Pumps, Water Systems Division.

This completes the double for Brown Brothers, as they have been sole New Zealand distributors for Goulds' Industrial Products Division for more than 15 years.

Goulds Pumps Inc designs and manufactures pumps, motors, and accessories for industrial, agricultural, commercial, and consumer markets.

Industrial markets account for approximately 64% of the company's sales. These include: chemical, petrochemical, refining, pulp and paper, utilities, mining and municipal, including waste water treatment systems. The remaining sales, representing approximately 36% of its business, includes pumps, motors and accessories for domestic water and sewage systems, agricultural, irrigation and commercial users.

With headquarters in Seneca Falls, New York, where the company was founded, Goulds Pumps Inc. has sales offices worldwide, manufacturing facilities in New York, Pennsylvania, Oklamhoma, Texas, California, Canada, Italy, the Phillipines and Mexico.

Goulds Pumps has manufactured pumps since 1848, and today the company is an acknowledged leader in the industry. As the world's largest exclusive manufacturer of Pumps Goulds are able to offer a very comprehensive range of products and accessories. In turn this means that Brown Brothers who have over 80 years experience in the pump industry are more able to meet the demands of the 90s and still offer the same commitment to customer service and excellence that the company has become known for.

The pumps offered by Goulds' Water Systems Division represent "state of the art" technology and design, with the innovative use of stainless steel componentry for long life and maintenance free dependability.

Important Marlborough Well

SINCE 1973 the Waimea Drilling Co has been carrying out drilling operations for the Marlborough Catchment Board, now the Marlborough Regional Council.

The latest of these wells was drilled on the Wairau Plains near the Wairau Bar.

Mr Jon Cunliffe, of the Marlborough Regional Council says the purpose of the well was two-fold . . . to act as a monitoring well and to confirm the geological interpretation of formations attained from bores further inland.

He says pumping tests were also carried out on the well, as at the time it was drilled a salmon farming project had applied to draw off 250 litres a second. Mr Cunliffe says the salmon project did not eventuate.

He says the well is now being used to monitor water levels and water quality.

This investigative water well was drilled for the Marlborough Catchment Board under the supervision of Jon Cunliffe.

The 250 diameter well was drilled to a 50m depth penetrating the main aquifer at 48m to 49.3m. Casting of 125mm diameter was then run and drilled to 77m.

The hole was then open hole drilled to 83.5m. Having not encountered any more aquifers, the 125m casing was withdrawn and the 125mm hole backfilled.

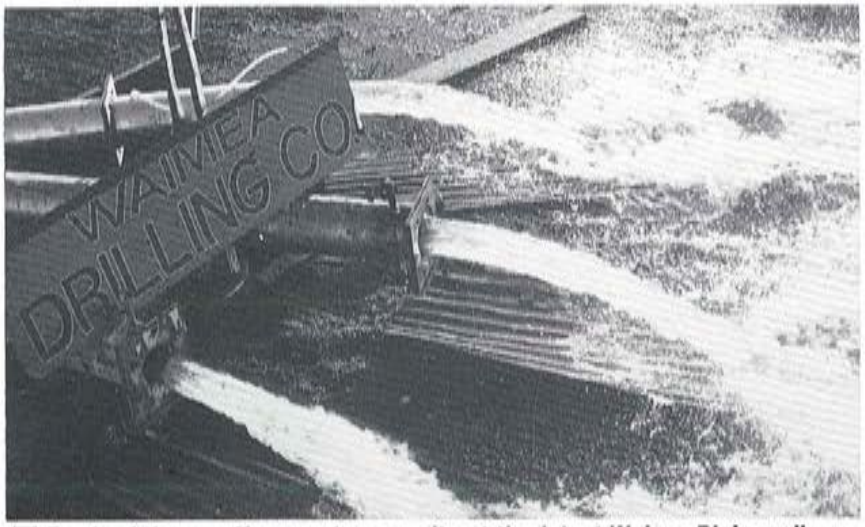
A 250mm telescopic screen was then fitted at the 48-50m level and exposed by jacking back the 250m casing. The well was then developed mainly using a valved surge plunger and some airlift pumping.

The site was at the Wairau Bar on the east coast of the Wairau Plain in Blenheim.

The well was drilled by myself and "Stumpy" Mercer, for first cable tool drilled to 50m. Sam Woodford and Mark McCully drilled the 125mm rotary drilled section to 83.5m.

This water well can be classed as quite good, but has only 20% of the hydraulic potential of other well sites we have drilled on, only a short distance south of this site.

A 48 hour continuous pump test was carried out using an "Allen Gwynnes "8" surface centrifugal pump powered by a 471 GM diesel engine.



☐ ***Bank of three oriface meters on site at the latest Wairau Plain well.***

Lighting was supplied by the drilling rig's welder generator and hot meals, necessary when working overnight in winter conditions, were supplied from the caravan.

The pumping details of the well were as follows:

Static level and 200mm to minus 300mm (dependent on tide).

Pumping rate 1600 gallons per minute.

The flow rate was controlled by a 8" gate valve and measured by a bank of three 8" oriface meters, fitted with 150mm oriface plates.

This well is the most recent of 20 wells we have drilled for the Marlborough Catchment Board during the past 15 years. The purpose of the wells is a study of the geological lithology, combined with the hydrological potential appraisal of the Wairau Plains, to assist with water allocation in the area.

Continued from Page 12

ure rating, the hole was abandoned and a second hole started at the other end of the cellar.

To speed up drilling in the hard limestone and silicified mudstones a 4" (101.6mm) Down the Hole Hammer was used to drill a 5½" 8139.7mm) hole. VAM 4½" (114mm) casing was set at 210m (690ft) and when surveyed this was found to be 12° off vertical. Tullow agreed to accept 12° but nothing greater, at 235m (770ft) the angle was 14° despite all attempts to straighten it. At this depth one wing came off a string stabiliser and went through the casing. Lack of money prevented any further drilling and the receiver was called in early in 1988.

This is very brief and potted summary of the Highland Slimfield operation which gives no true reflection of the good engineering and technology that had gone into the project. Lack of money and time forced some short cuts in the final stages and poor quality casing and improvised drilling techniques brought final closure but nearly all the major elements of this large and complex unit worked well despite only a 10 day testing and training period. Considerable and unnecessary expense and delay was caused by government officialdom which did not appear to understand or appreciate many of the rigs built-in safety features and insisted on duplicate and manual safety devices, late delivery of some major oil field equipment also added to costs and delays.

It is sad that industry failed to support this very imaginative and original project and practical experience in drilling slim holes in the UK has been set back by several years. Whilst it is small comfort to the Highland Slimfield personnel it should be recorded that Kenting Drilling who went to Timahoe to drill this well abandoned the hole at 380m (1245ft) after approximately three months of struggles against lost circulation and hole problems and the well was never completed.

Because the Highland Slimfield unit represents some of the latest and best technology certain aspects will be considered in more detail.

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On the average well costing $15,000 this is a saving to you of $1462.50. Only one condition. The well will be intended to be completed before 1.1.92.

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Our prices have not increased for five years!

PICTURES FROM THE PAST

THE LONGYEAR 2N GAS DRILL mounted on steel truck, has proven to be ideally adapted for holes up to 2,000 feet in depth, using A rods and recovering 1⅛" core, where rapid moves are essential. The machine is a complete drilling unit, with nothing to be disconnected when moving.

The drill itself is the standard LONGYEAR 2N, without the steam engine. It is regularly equipped with a 12" feed hydraulic swivel head, but can be furnished with a 24" feed. N rods, 2⅜" in diameter, will pass through the drive rod.

An additional brake, installed on the motor end of the drill shaft prevents accidental dropping of the drill rods. This brake is controlled by the same lever that controls the drill clutch, so that the brake is applied simultaneously with the release of the clutch, an obvious advantage when hoisting a heavy string of rods or casing.

Motive power is furnished by a 30 h.p. gas engine, with clutch, three-speed transmission, cooling radiator, fan, fuel tank, and sensitive control throttling governor, which automatically increases the power under load. The motor can be run with gasoline or kerosene.

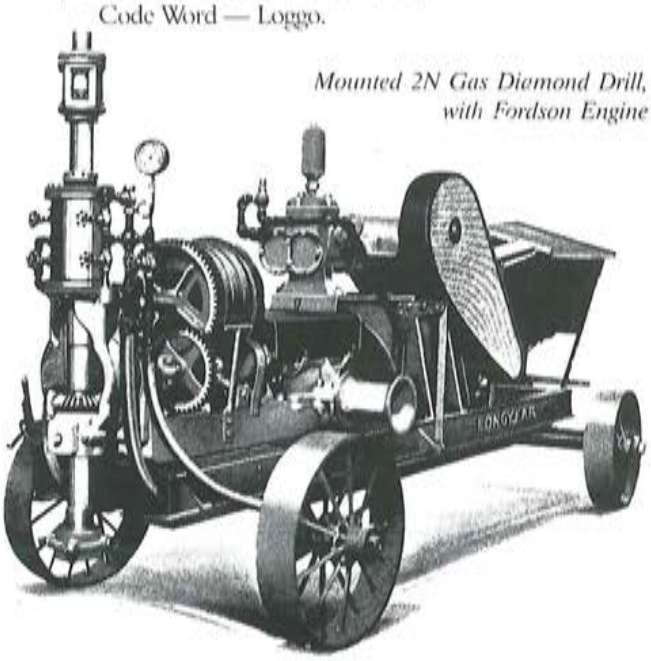
The pump is chain-driven, with clutch, and of adequate capacity for all work. It is equipped with relief and by-pass valves. The pump can be operated independently of the drill.

The machine is equipped with a telescopic shaft so that the drilling machine can be moved back from the drill hole to allow the hoisting of the drill rods. A flexible coupling on the shaft takes care of any variation in the alignment of the drill and motor, thus relieving the bearings of all undue wear.

All controls are within easy reach of the operator. A spool hoist driven by a gear off the main drill shaft is useful in sinking standpipe or surface conductor.

The truck is strongly made of steel with wide-rim steel wheels. It can be equipped with caterpillar tread for heavy ground. The truck is not automotive.

Capacity — 1,000 feet N hole (3" dia 2⅛" core)
2,000 feet A hole (1⅞" dia. 1⅛" core)
Code Word — Loggo.



Mounted 2N Gas Diemond Drill, with Fordson Engine