

TECHNOLOGY IMPACT • HIGHLIGHTS



1993  

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CSIR

**"The duality of technology's challenge  
for South Africa and the CSIR  
is to respond effectively to  
the changing demands  
of technology for development  
and technology for competitiveness,  
to meet the needs of our communities  
and to become competitive  
in global markets."**

Dr Brian Clark, President, CSIR



## TECHNOLOGY IMPACT

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1993  
CSIR

## THE ENVIRONMENT

### Environmental Auditing

The CSIR is at the forefront of the development and implementation of Environmental Auditing in South Africa. EA is a relatively new concept in this country, although it is by now well established in Europe and the USA.

It is used as a management tool to provide information on the most economical trade-off between profitability and responsible environmental management available to industries and other operators. This is becoming vitally important because of the internationally growing awareness of the importance of responsible environmental management. Instances are known where South African industries were denied overseas contracts

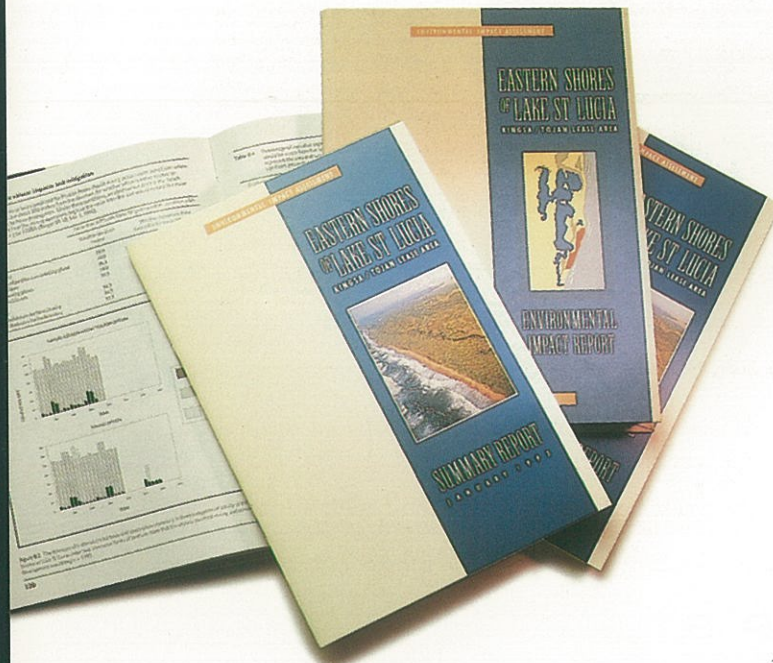
because they could not meet the stringent international environmental standards. EA can help them achieve this without unduly affecting their profitability.

### IEM helps industry to become greener

The recent Pelican Joint Venture environmental impact assessment (EIA) undertaken by the CSIR and the University of Cape Town's Environmental Evaluation Unit for Alusaf's proposed aluminium smelter at Richards Bay, as well as the comprehensive environmental impact assessment of the two alternative land-use options for the Eastern Shores of Lake St Lucia, embraced the Integrated Environmental Management (IEM) approach. This approach allows EIA specialists to integrate environmental considerations with project planning.

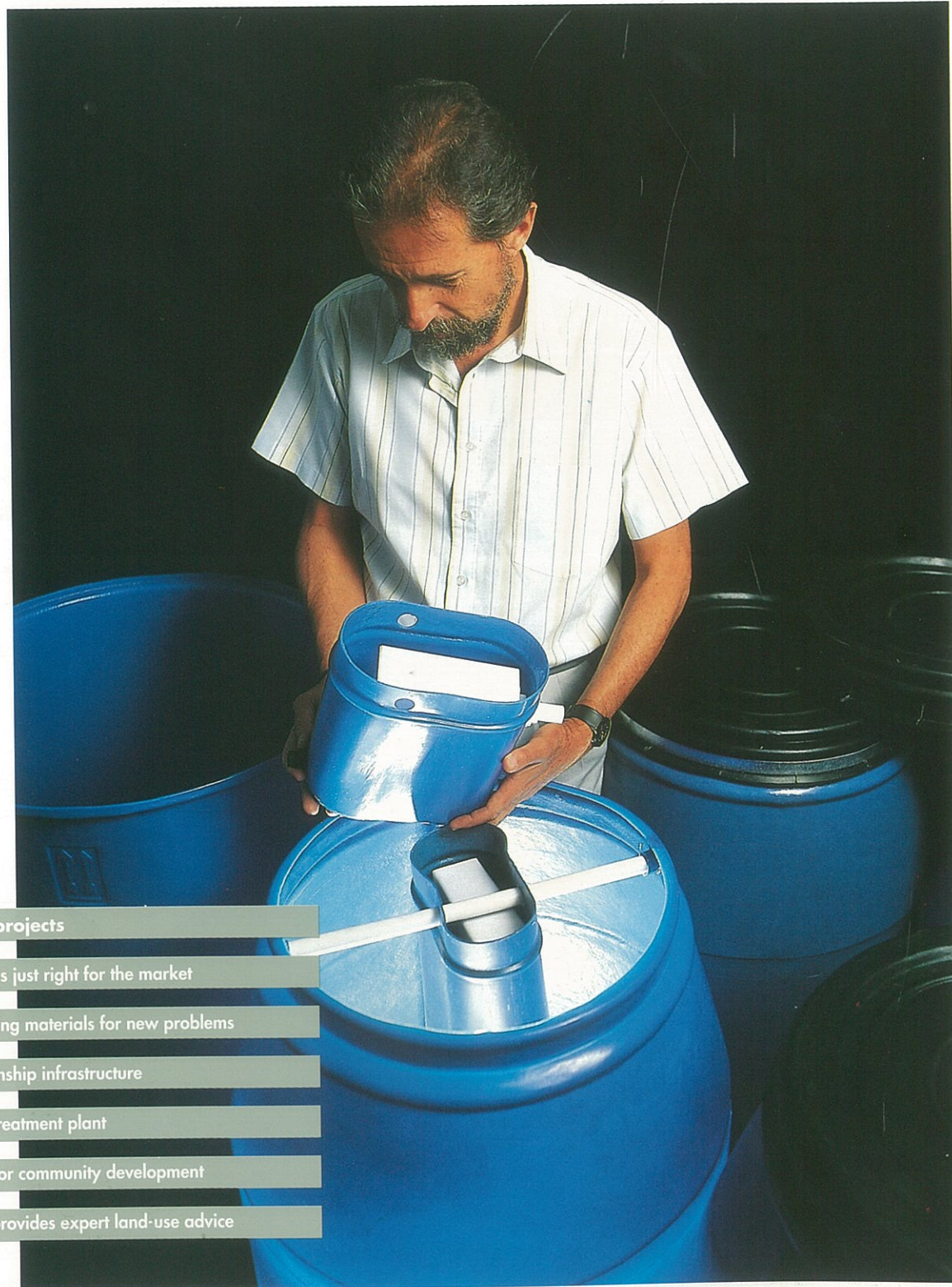
### Health watch for estuaries

The Estuarine Health Index, based on many years of applied research on South African estuaries, was developed to assess the environmental health of estuaries and lagoons. This research, now formulated into a marketable product which has also been well received in Kenya and on the African east coast, will make an important contribution to the conservation of these fragile natural environments. The research was funded by the Department of Environment Affairs.



### Some other projects

- Emulating nature's way of purifying water
- Help for private conservation landowners
- SA team helps to explain world climate
- Geophysics helps solve pollution problems
- Kiepersol looks at acid deposition
- EMAMET monitors the atmospheric boundary layer
- Coastal management under the spotlight



**Some other projects**

- Housing that's just right for the market
- Known building materials for new problems
- Tackling township infrastructure
- New water treatment plant
- Technology for community development
- LANDMAN provides expert land-use advice

**DEVELOPING COMMUNITIES**

**Special water meter for developing areas**

A simple yet effective device which can measure out a daily volume of pre-paid water for the home owner in developing areas was developed for Southern African conditions.

The system allows the user to decide beforehand how much he wants to spend on water per month, and it is then up to him to make the daily amount of water fulfil all his requirements.

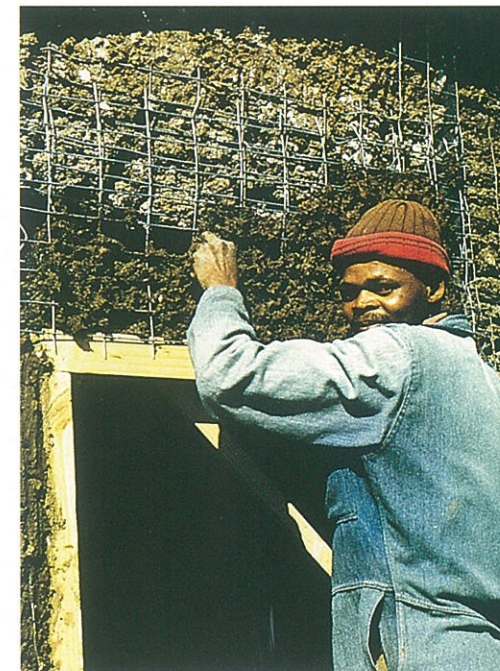
authorities, the local community and end users that the safety and health of the community and users will not be endangered by the construction.

**Managing the transition to cities of opportunity**

Research has shown that the typical sprawling, fragmented South African city does not promote economic interaction opportunities. Besides imposing high commuting costs, current urban forms dissipate the high densities and conglomeration required for efficient urban job creation. A study in Cape Town's developing areas has shown that joint ventures could be used to create high density areas of opportunity around major transport nodes. Further research is investigating the development of appropriate joint venturing and associated approaches to urban management policies.

**Appropriate standards for schools and clinics**

The experience and expertise of members of the CSIR's Building Technology staff was tapped by Agrément South Africa when it extended the scope of its MANTAG criteria to include school and primary health care buildings. The criteria previously catered only for simple, single storey dwellings and their related outbuildings. MANTAG approval of such non-standardised forms of construction is intended to assure the relevant



## BEYOND OUR BORDERS

### South American initiative

The CSIR has been co-operating with Laboratorio Tecnológica del Uruguay (LATU) in assessing the commercial viability of a gracilaria culture system in that country. This has been expanded to include the application of our coastal engineering services, eg. seismic surveys, to identify pathways for a marine effluent disposal pipeline in Punta del Este.

Further technical advice will be provided on the beach crossing and pipeline behaviour under local wave conditions. Investigations have also been launched into the technical feasibility and commercial viability of trout farms in Uruguay; the application of our groundwater expertise to water supply problems; and the installation of instrumentation in Uruguayan river and lagoon systems for data transmission to a central capture point in Montevideo.

### Boreholes relieve Bulawayo's thirst

The discovery and delineation by the CSIR of a large well field underneath the city of Bulawayo in drought stricken Zimbabwe was an outstanding example of how technology can improve the quality of life. It was estimated that close to 4 million cubic metres of groundwater, which could be tapped through boreholes, lay hidden beneath the city.

### Innovative Tensojet gets high praise

The Tensojet Tensile Tester, an instrument based on a patented new method developed by the CSIR for the high speed tensile testing of yarns, was lauded in the international technical press as "a revolutionary high performance testing installation which opens up undreamed of quality control possibilities for textile mills". After evaluation trials with a test model built by the CSIR, a Swiss textile machinery manufacturer - Zellweger Uster - was licensed to do the final development work and to manufacture and market the new tester internationally.

### Some other projects

- Cape Point now part of RAMP
- CSIR becomes agent for MIKE 11 (Denmark)
- German links renewed
- SPOT pics put SA in the picture (France)
- CSIR International Village at SAITEX
- Water treatment in Mauritius investigated
- Textile training extended to Zambia





#### Some other projects

- New milling machine meets the need
- New bulk blender for fruit pulp
- UV meter probes all ranges
- New, better laser machine
- Portable tester for flasher units

## THE MANUFACTURING INDUSTRY

### Low cost tooling

Concurrent engineering is the concept whereby a team approach is applied in bringing a new product to market in the shortest possible time by bridging the gap between design and manufacture.

The CSIR, as member of a "family" of organisations which pooled technology resources, offers rapid prototyping and development assistance to the tooling industry. Stereolithography is emerging as a key developing technology in facilitating concurrent engineering, enhancing quality and lowering costs. The potential impact on the investment casting industry and cost savings by elimination of tooling is considerable. The process is expected to be available towards the second half of 1993.

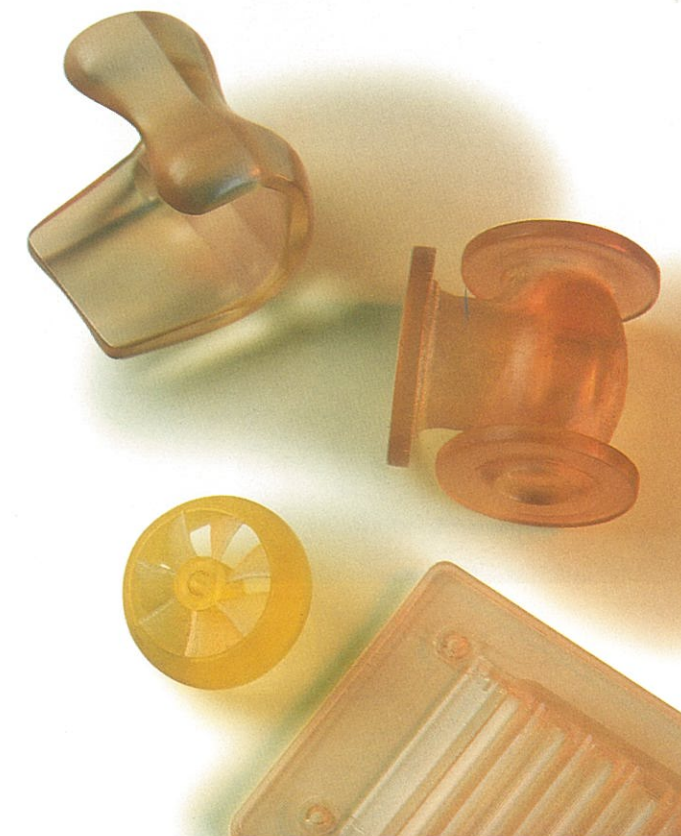
### CSIR wins with FAST system

The first FAST system (Fabric Assurance by Simple Testing) to be commissioned in South Africa has proved its value at the CSIR in Port Elizabeth. The FAST system of objective fabric measurement enables routine measurements of fabric properties which play a crucial role in determining fabric tailorability and garment appearance. This makes it a valuable tool for fabric and garment manufacturers.

### Plasmatherm services

An agreement has been concluded with Scaw Metals Ltd for the formation of a joint business centre offering a unique high technology plasma nitriding and plasma nitrocarburising service to industry. The CSIR's facility was integrated with a

mothballed unit which came into Scaw Metal's possession after a takeover of Standard Brass Foundries. The equipment was transferred from the East Rand to CSIR premises, where it underwent a complete refurbishing before installation. The integrated facility enables the business centre to provide economical small scale production and process development services. This enhanced service puts the CSIR in a position to transfer technology back into industry, thereby fulfilling one of its primary objectives.



## SMALL AND MEDIUM ENTERPRISES

### Community-relevant Appropriate Food

### Technology (CRAFT)

A multi-disciplinary group of engineers, technologists and scientists was established to transfer food processing technology to small and medium enterprises in developing communities.

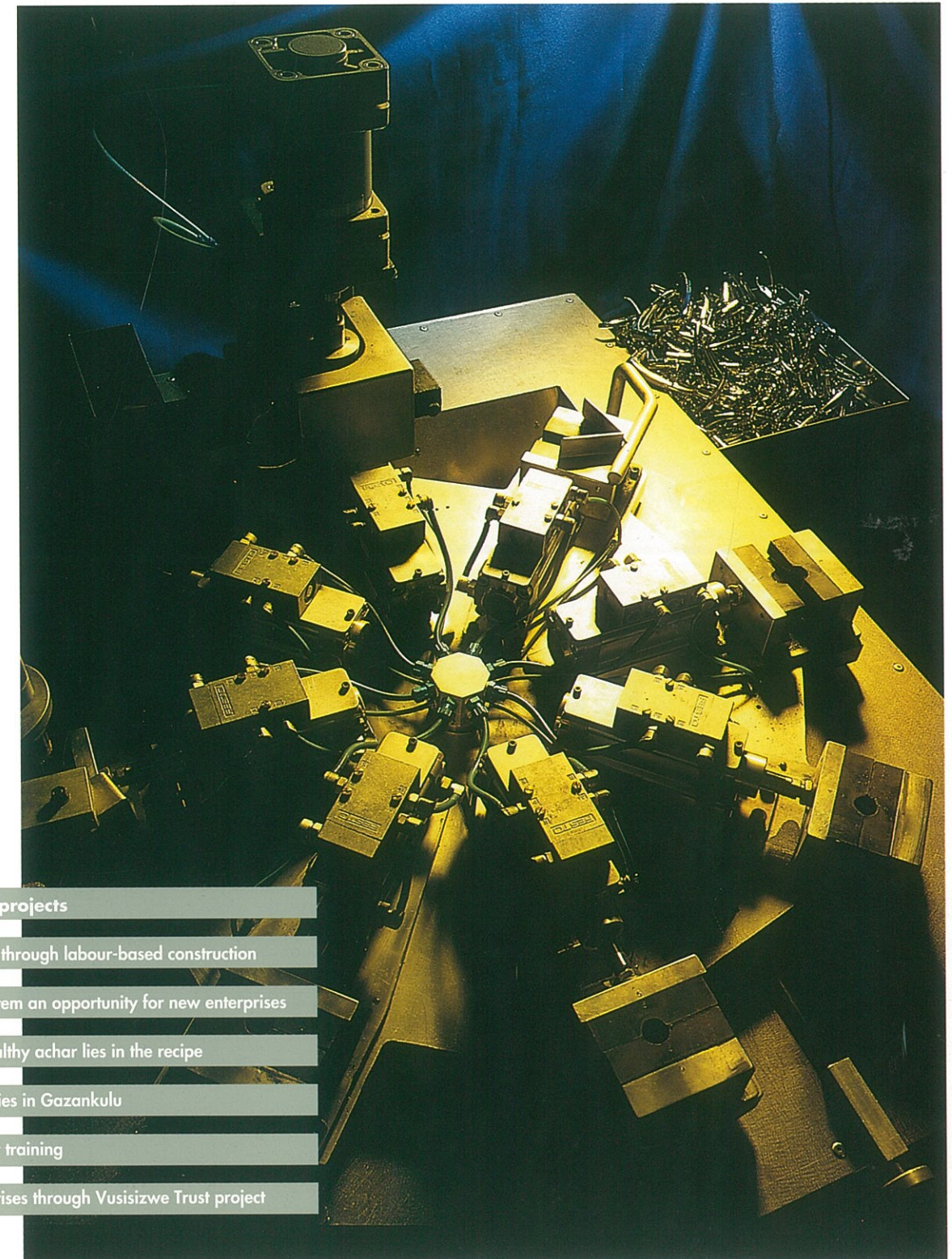
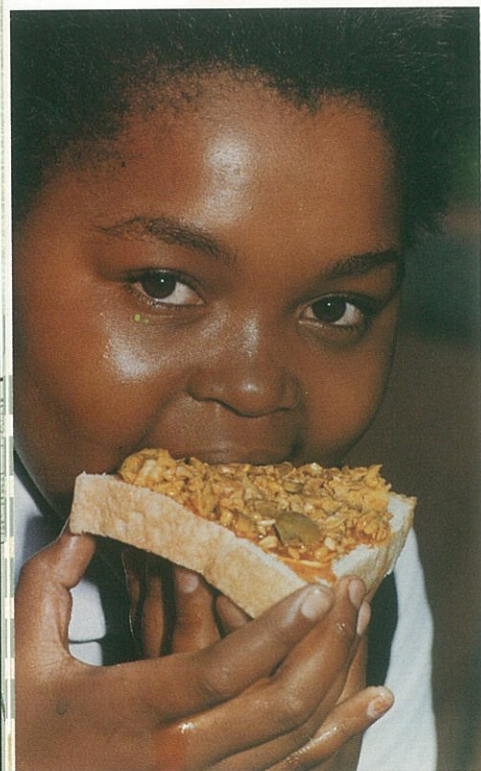
The technology transferred provides economically sound opportunities for employment while meeting the identified needs of developing communities. CRAFT has been actively involved in establishing businesses in sunflower oil production, baking and achar production and in developing processing tools for existing businesses.

### Low-level automation is the answer

Custom built modular low level automation systems, designed and developed by the CSIR, have proved to be a highly cost effective solution for improving quality and productivity rates on the production lines of a number of relatively small scale manufacturing concerns. This approach also saves space and frees workers to be retrained for other jobs.

### Job seekers turned into job creators

Job seekers are being turned into job creators by the CSIR in Port Elizabeth. Initiated by the CSIR, but assisted by local business and community organisations, a Community Self Employment Centre (COM-SEC) is being set up to drive self-sustainable job creation projects and the development of entrepreneurial skills among the unemployed in the greater Port Elizabeth region. Basic and advanced training courses in skills such as knitting, sewing, weaving, welding, plumbing and others are involved together with tuition in literacy and business skills. After care and infra-structural support for the entrepreneur will be made available through mechanisms for funding, marketing, product development, raw material supply and quality control.



### Some other projects

- Job creation through labour-based construction
- Sanitary system an opportunity for new enterprises
- Secret of healthy achar lies in the recipe
- Rural nurseries in Gazankulu
- Agroforestry training
- New enterprises through Vusisizwe Trust project



#### Some other projects

- Road infrastructure course presented
- Appropriate standards for bituminous surfacings
- Flood damage prevented with rocks
- Five years of reliable traffic information
- Cutting the costs of township roads
- Arrestor beds dispel runaway nightmares
- Ship motions computed with numerical models

## T R A N S P O R T A T I O N

### The transportation network

The CSIR promotes the optimal use of resources to improve and preserve the transportation network and enhance road traffic safety:

- Research conducted for the Southern African Bitumen and Tar Association led to the implementation of a cost effective mix design procedure for large aggregate mixes for road bases to accommodate increasing axle loads. The adaptation of porous asphalt to local conditions enhances the road environment by significantly reducing road noise levels and vastly improving drainage, thus nullifying water spray. Research into appropriate standards for bituminous surfacings has enabled the implementation of more affordable and appropriate surfacings for low volume roads.
- Researchers formulated appropriate standards for low volume roads for the Department of Transport. Guidelines on low-cost upgrading of gravel roads maximise the use of existing alignments and material strength while maintaining appropriate quality and safety.
- Research on damage to pavements caused by multiple axle vehicles shows that the equivalent number of standard (80 kN) axle loads per heavy vehicle varies with pavement types. Guidelines have been developed to determine these values for typical trucks and pavements in South Africa.
- Researchers and the Department of Transport collaborated to formulate a

national policy on traffic safety for South Africa. This was approved by the Minister of Transport in November 1992 as a first step towards implementing the Traffic Management System in April 1993.

- For the Transvaal Provincial Administration the effectiveness of different rehabilitation designs was evaluated using the Heavy Vehicle Simulator. Findings indicate that certain road designs may be cost effective for a greater range of traffic than previously accepted.





## DECISION SUPPORT

### Managing to save money

PREMIS, the computerised Professional Real

Estate Management Information System devel-

oped and marketed by the CSIR, has attracted a

great deal of attention among the more pro-

gressive UK and USA estate managers.

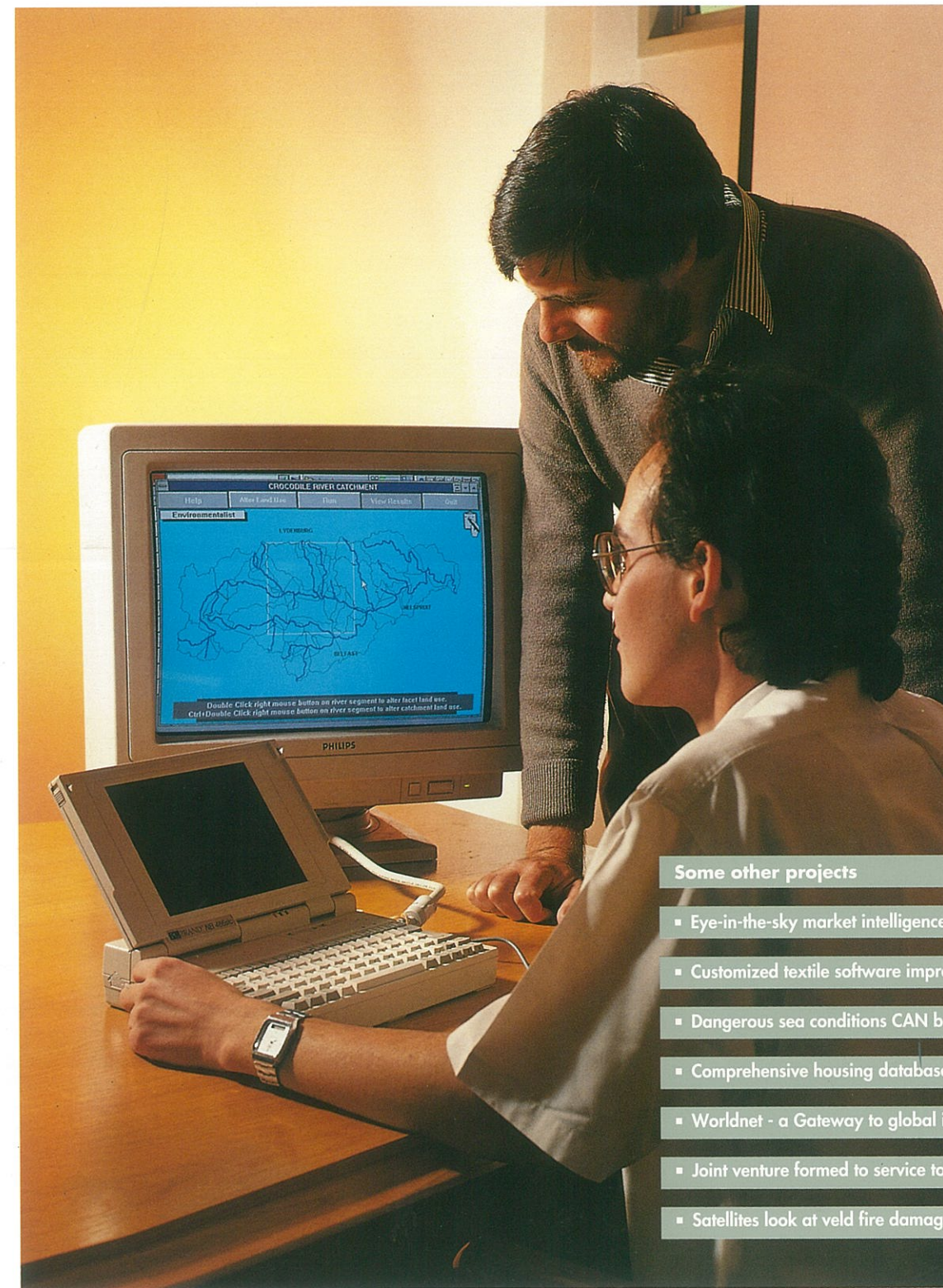
The system integrates estate management functions, leading to cost saving decision making. It allows the estate manager to provide top management with strategic occupancy or expenditure trends via dynamic business graphics on electronic maps or drawings of the estate. At the same time, it enables the management of operational activities such as rental and lease administration, maintenance or energy and water consumption to be much more effective.

### The catchment resource assessment model CRAM

A computer based model to assist in land use and water resource planning, called CRAM - for Catchment Resource Assessment Model - was due for testing by users in April 1993. It runs on a PC under Microsoft Windows. With CRAM, which has a hydrological basis, the user can try out different patterns of land and water use and assess the impact on the economy, ecology and people of a region.

### Site-growth modelling as a management tool

A site-growth study done on behalf of the Forestry Branch of the Department of Environment Affairs to assess the productivity potential of forest land, points clearly to largely increased yields through correct site-species matching. Predictions obtained through this study are based on a refined system of site-growth modelling and extrapolation techniques, coupled with forest finance models. Different plantation species can be accurately evaluated for a specific site with this system, and economic implications can be determined in advance, thus avoiding costly mistakes in wrong species choice.



### Some other projects

- Eye-in-the-sky market intelligence
- Customized textile software impresses
- Dangerous sea conditions CAN be predicted
- Comprehensive housing database
- Worldnet - a Gateway to global information
- Joint venture formed to service tourism
- Satellites look at veld fire damage



#### Some other projects

- This groyne will aid diamond mining
- Water droplets to prevent explosions
- Nature-friendly coastal mining
- Underground communication system
- Trees used as infiltration barriers
- Exploration made easy

## MINING AND EXPLORATION

### Kangela on-line ash monitor

A joint project undertaken with the AEC aimed at developing an on-line ash monitor culminated in the sale of five of these units to an industrial concern.

The monitor - or Kangela as it is known - is mounted above a conveyor belt and continuously monitors the ash content of coal by means of nuclear techniques. Coal processing involves the separation of low-ash (good quality) from high-ash (poor quality) coal by means of a dense medium. By providing a continuous reading of the ash content of the coal product, the Kangela allows better control over the dense-medium process, resulting in improved yields and improved consistency in the quality of the coal produced.

### Rock classification made simple

A computerised Optical Rock Size Classifier, developed and patented for use at gold mines, rapidly provides operators with information that allows them to achieve the optimum particle size for gold extraction during blasting and crushing operations. This appreciably improves the mining yield.

### Cross-hole seismic tomography

State of the art instrumentation developed by the CSIR utilising high frequency seismic waves for cross-hole seismic tomography enables us to offer a package that includes data capture, data processing and interpretation. This type of tomography involves the recording of seismic data with sources placed at various depths in one borehole, and a string of geophones in another bore-

hole situated between 20 m and 100 m from the first. Detailed coverage of the rock section between the two boreholes is achieved with this multiple source/multiple receiver layout.



## NEW PRODUCTS AND SERVICES

### ISAP on CD-ROM

The Index of South African Periodicals (ISAP), a joint venture between the CSIR and the State Library, was recently released in CD-ROM (Compact Disc Read Only Memory) format. This was the first time that a CD was pre-mastered in South Africa for commercial use.

ISAP, one of only three CD-ROMs in South Africa, contains bibliographic information and excerpts on all South African generated magazine articles. Articles on any subject can be searched on this fast and easy to use reference data base by using subjects, subject categories, words in titles or titles.

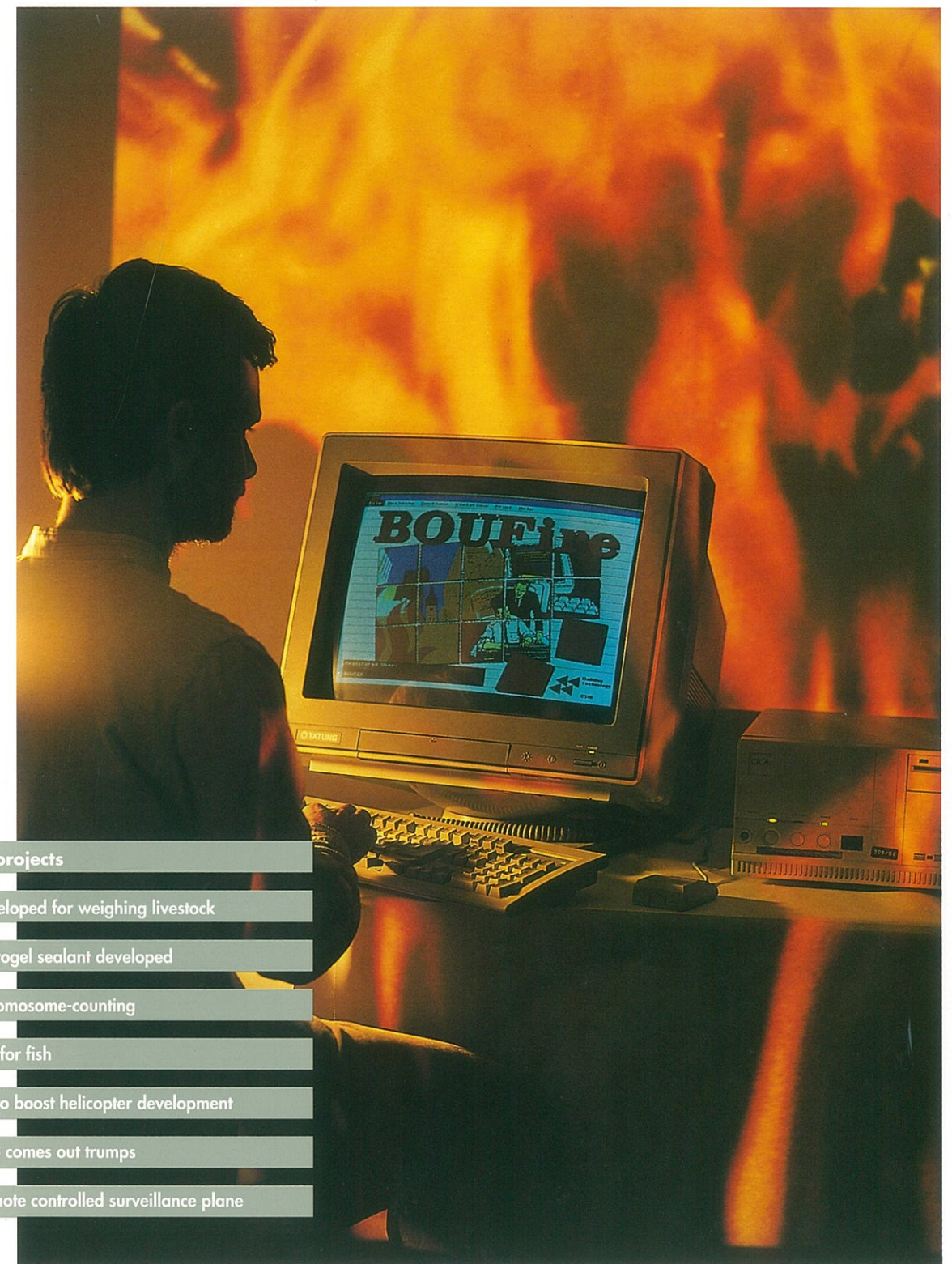
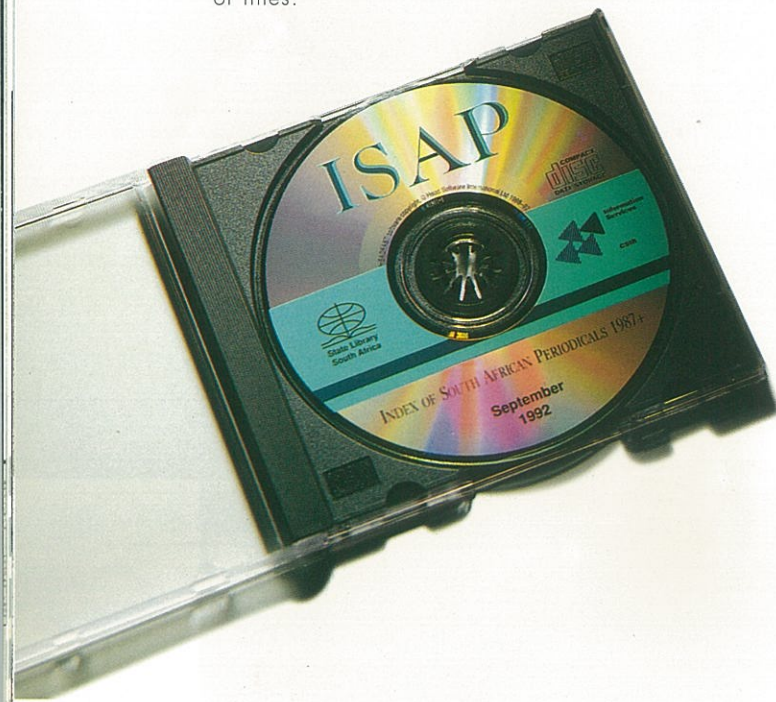
in traditional communication tools and library systems for this industry. CSIR-Quantarc, developed in association with Poulter Communications of the UK over a period of almost three years, offers immediate access to an advanced network of trade and technical information. It uses CD-ROM technology to store very high resolution images which can be rapidly displayed on a 49 cm monitor. The system requires less than two seconds to locate a particular page. It is the first step towards a range of comprehensive electronic information services to benefit industry throughout Southern Africa.

### BOUfire streamlines application of the fire code

BOUFire is a PC-based software package developed to assist building professionals with the interpretation and application of the fire regulations within the National Building Regulations. BOUFire acts as an expert assistant to the building designer, reducing the possibility of overlooking important details. It requests only the information relevant to the particular building design, relieving the professional of the time consuming task of determining which provisions are applicable. For regulating authorities, BOUFire holds the promise of faster, easier and more consistent checking of plans submitted for approval.

### Builder's library goes electronic

Quantarc, an electronic information service for the construction industry, represents a revolution



### Some other projects

- LiveLoad developed for weighing livestock
- Wonder hydrogel sealant developed
- Cracking chromosome-counting
- Safe journey for fish
- New facility to boost helicopter development
- KelRon pump comes out trumps
- Keen Eye remote controlled surveillance plane



**Some other projects**

- Rail commuting made safer
- Fire experts solve hot problems
- Environmental risk can be managed
- Virus protection software

**COMMERCIAL SECURITY**

**Secure Network Mail**

Unauthorised access to electronic mail has serious implications for any organisation which uses an electronic network system.

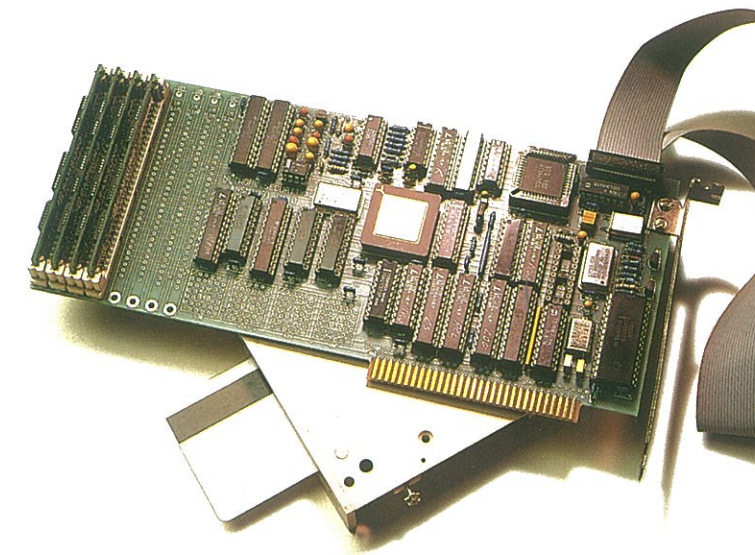
The CSIR has developed a system called SECMAIL, which ensures security for network mail systems. It offers secure and authenticated electronic mail facilities with state of the art public key and smart card technology. For use with SECMAIL, the CSIR has developed its own Integrated Security System (ISS) hardware, which is a general purpose cryptographic card incorporating a transputer processor and a fast encryption/decryption chip and a smart card reader for IBM-compatible PCs.

**ACL "fence" is a world leader**

A unique intelligent electro-optical intruder detection system which was designed, developed and industrialised by the CSIR, is set to become a world leader. The ACL Optical Detection System, for which patents are pending world-wide, could probably earn South Africa substantial amounts in foreign currency and provide the CSIR with royalty income for many years to come.

**Optical link**

In terms of an agreement with Teljoy Business Services (TBS), the CSIR has developed a free-space optical link for TBS's metro railway security system. The CSIR won this contract in competition with several possible suppliers, including two overseas companies. The optical link provides for the transmission and reception of video, audio and data information. A set of links installed in each coach enables communication throughout the train.



## HEALTH AND SAFETY

### Lysine project

A laboratory scale process originally developed by the CSIR using a bacterium genetically modified by its researchers to produce lysine at high yield and productivity, has led to a recent announcement by AECL of a R300 million fermentation plant which will be commissioned by that company in 1995 to produce 11 000 tons of this amino acid a year.

This followed an agreement concluded with AECL in 1987 to develop jointly and exploit the technology. The CSIR subsequently carried out R & D activities in collaboration with AECL in the areas of laboratory and small pilot scale fermentation optimisation, whereas AECL took the development stage further in its larger scale pilot facility.

### CAP/MAP cuts out the preservatives

Controlled or modified atmosphere packaging (CAP/MAP) is a new development in food packaging to extend the shelf life of food products. This involves the packaging of chilled perishable foodstuffs in flexible materials, combined with replacing the air in the package with a special gas mixture which is designed to keep the quality of the food at a desired level. The CSIR has facilities available to develop appropriate packaging and gas combinations by analysing gases and the microbial quality of products.

### Putting the lid on dust explosions

In South Africa, at least one dust explosion takes place every week. Such explosions can result in

injuries and loss of production and, at worst, fatalities and plant shutdown. To address this problem, the first industrial dust explosion test laboratory in Africa was commissioned at the end of August. The techniques used in the laboratory are drawn from the best in the world. The main apparatus is a 20 litre explosion vessel, which will assist in the investigation of dust, gas, mist and hybrid mixture explosions. We can now advise on the explosion hazard of a specific environment, determine the explosion parameters of a specific dust, recommend explosion protection measures and assist in the implementation of such measures.

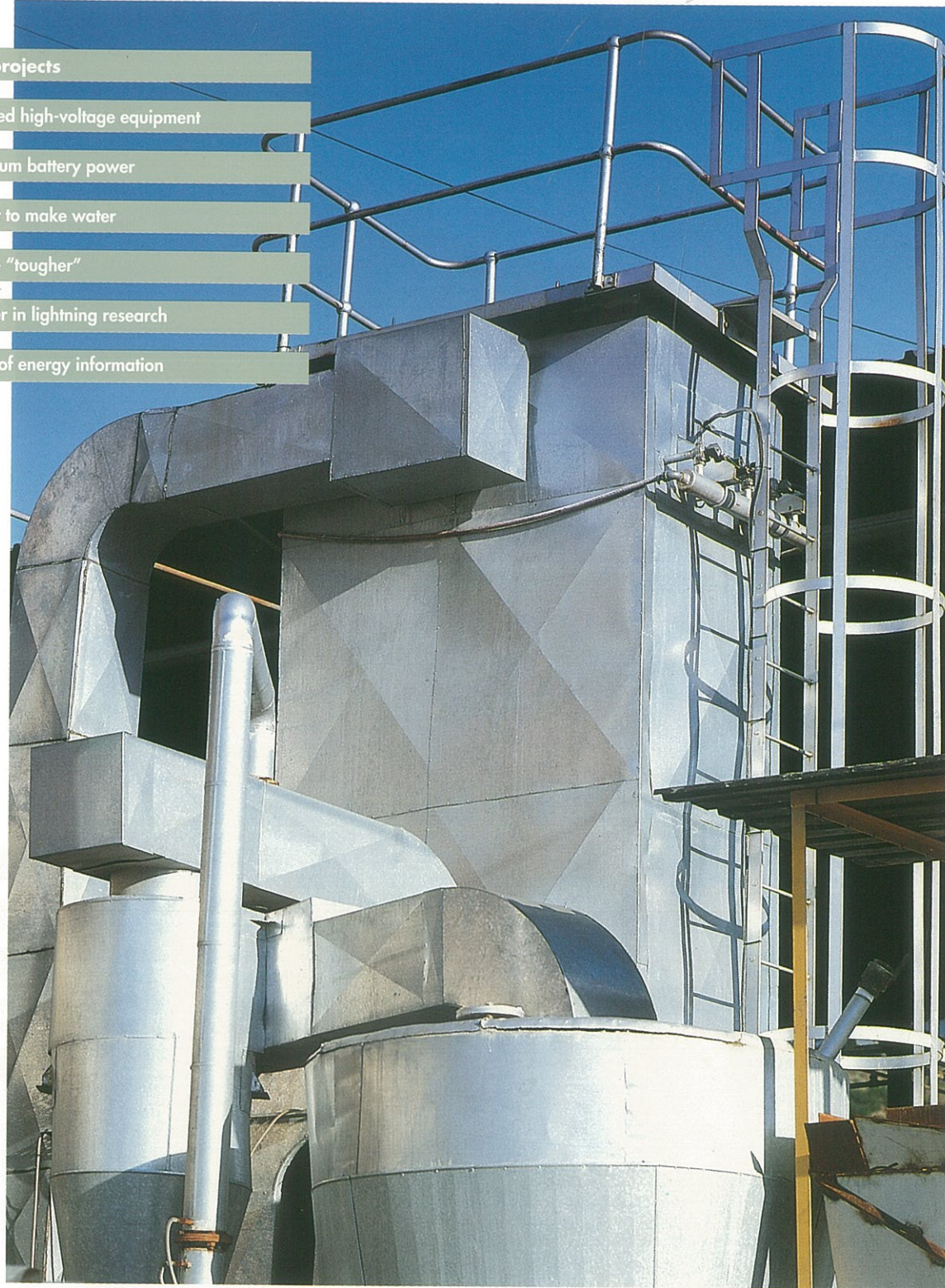


### Some other projects

- A plan made with hazardous waste
- Internal air pollution monitored
- CSIR becomes shareholder in environmental health
- Bugs to eliminate odours
- Are we complacent about pesticides?
- Rural dwellers at risk from air pollution
- Isotopes in water tell what goes on

#### Some other projects

- Testing installed high-voltage equipment
- High-tech lithium battery power
- Using sunlight to make water
- SA ohm made "tougher"
- A world leader in lightning research
- Database full of energy information



## ENERGY

### Fluidised-bed dryer

Coal producers annually experience substantial losses due to the production of fine coal which cannot be sold commercially. Such fine coal retains moisture, which reduces the heat value of the coal and also results in increased transport costs and mechanical handling problems.

Thermal means are required in most instances to reduce the moisture from about 20 per cent to below 7 per cent, for which fluidised-bed drying using waste coal as the energy source is particularly suitable. A new pilot plant fluidised-bed dryer was established to demonstrate the technical and commercial viability of fine-coal drying to the local coal industry. This new development has safety and operational cost advantages over other dryers.

### Isosynthesis Project

The objective of this project is to develop a catalytic process for the simultaneous production of methanol and isobutanol as essential intermediates for the manufacture of fuel ethers which will be used in lead-free petrol formulations. The CSIR is involved with an overseas partner who is carrying out an engineering design and commercial feasibility study, based on our catalyst development.



## Sumário

### O Ambiente

IEM (Direcção integrada do Ambiente) ajuda a indústria a tornar-se mais "verde"  
Verificação, relativa ao ambiente  
Vigia sanitária para os estuários

### Comunidades em Desenvolvimento

Contador especial da água para as zonas em desenvolvimento  
Padrões apropriados para escolas e clínicas  
Administrar a transição para cidades de oportunidade

### Além das nossas fronteiras

Poços artesianos aliviam a sede de Bulawayo  
Iniciativos sul-americanos  
O "Tensojet" inovativo, é altamente louvado

### A Indústria faricante

Trabalho com ferramentas a baixo preço  
CSIR ganha com sistema FAST  
Serviços de pasmatermo

### Empresas pequenas e médias

CRAFT (Tecnologia apropriada de Comida aplicável à Comunidade)  
Produtores de Emprego transformados em Criadores de Emprego  
A resposta é a automação de baixo nível

### Transporte

A Rede de Transporte

### Apoio de Decisão

Conseguir Poupar Dinheiro com PREMIS  
O Padrão de Avaliação do Recurso na Bacia hidrográfica - CRAM  
Modelação de Crescimento secundário como Instrumento de Administração

### Indústria mineira e Exploração

Monitor da Cinza em Linha da Kangela  
Classificação da Rocha é feita simples  
Tomografia sísmica do Furo de Cruzeta

### Novos Produtos e Processos

ISAP sobre CD-ROM  
Biblioteca do Construtor faz-se Electrónica  
"BOUfire" moderniza a Aplicação do Código de Fogo

### Seguridade comercial

"Vedação" ACL é um Conquistador mundial

Rede postal segura  
Ligação óptica

### Saúde e Seguridade

Projecto Lysine  
CAP-MAP elimina os Preservativos  
Pôr o Tampo nas Explosões de Pó

### Energia

Secador do Leito fluidificado  
Projecto Isosintese

## Résumé

### Environnement

Le système IEM (Gestion Intégrée de l'Environnement) assiste l'industrie dans ses efforts de réduire son impact sur l'environnement  
Pour contrôler l'état de l'environnement  
Pour surveiller l'état de santé des estuaires

### Communautés en voie de développement

Compteur à eau spécialement conçu pour les régions en voie de développement  
Normes appropriées pour les écoles et les cliniques  
La gestion de la transition vers des villes pleines de possibilité

### Au-delà de nos Frontières

Le forage de puits pallie au manque d'eau dans la ville de Bulawayo  
Une initiative lancée en Amérique du Sud  
Le Tensojet, un appareil innovateur, reçoit des éloges

### Fabrication industrielle

Outils de prototypes rapide et à faible coût  
Le CSIR réussit avec le système FAST (contrôle simple des propriétés des textiles)  
Procédé de traitement thermique de surface par nitruration au plasma

### Petites et moyennes entreprises

Techniques de production de denrées alimentaires adaptées aux communautés (CRAFT)  
Des demandeurs d'emploi transformés en créateurs d'emplois  
Un faible niveau d'automatisation, voilà ce qu'il faut

### Transport

Le transport routier

### Assistance à la prise de décisions stratégiques

La gestion d'immeubles avec le système PREMIS permet d'importantes économies

Un modèle d'évaluation des ressources des bassins fluviaux  
Modèle de croissance applicable aux plantations comme moyen de gestion

### Mines et Exploration

Le Kangela, moniteur en ligne pour le contrôle des cendres  
Pour simplifier la classification des roches  
Tomographie sismique par forage transversal

### Nouveaux produits et procédés

L'index des périodiques sud-africains (ISAP) sur CD-ROM (disque optique compact)  
La bibliothèque de l'industrie du bâtiment passe à l'âge électronique  
Le logiciel BOUfire facilite l'application du code de protection contre les incendies

### La sécurité dans le secteur commercial

La "barrière" de sécurité ACL tient sa place parmi les meilleures au monde  
Un système de sécurité pour les réseaux de courrier électronique  
Liaison optique

### Santé et Sécurité

Projet pour la fabrication de la lysine  
Le conditionnement par atmosphère modifiée ou contrôlée CAP/MAP permet l'élimination des agents de conservation  
Le coup d'arrêt aux explosions de poussière

### Energie

Sécheur à lit fluidisé  
Project d'isosynthèse

## Zusammenfassung

### Die Umwelt

IEM (Integrated Environmental Management), Integriertes öko-Management, hilft der Industrie "grüner" zu werden  
Öko-Audits (Umweltbetriebsprüfung)  
Überwachung des gesunden Zustands von Flussmündungen

### Stadt- und Regionalentwicklung

Besonderer Wasserzähler für Entwicklungsgebiete  
Angepasste Standards für Schulen und Kliniken  
Den Wechsel zu Städten mit besseren wirtschaftlichen Voraussetzungen meistern

### Jenseits unsere Grenzen

Bohrlöcher löschen Bulawayo's Durst  
Die Südamerika-Initiative  
Neu eingeführter "Tensojet" erntet grossen Beifall

### Die verarbeitende Industrie

Preiswerte Werkzeuginrichtung  
CSIR gewinnt mit dem FAST-System  
Plasmathermische Dienste

### Kleine und mittelständische Unternehmen

Regionalbezogene, angepasste Lebensmitteltechnologie (CRAFT)  
Arbeitsplatzsuchende werden zu Arbeitsplatzschaffenden  
Niedrig gehaltene Automatisierung ist die Antwort

### Transport

Das Transportnetz

### Entscheidungsunterstützung

Kapital einsparen durch PREMIS  
Das Einzugsgebiet-Wasserreserven-Beurteilungsmodell (CRAM)  
Gelände-Wachstums-Modelle als Managementhilfe

### Bergbau und Sondierung

Der Kangela on-line-Aschemonitor  
Gesteinsklassifizierung leicht gemacht  
Seismische Kreuzloch-Tomografie (röntgenologisches Verfahren)

### Neue Produkte und Verfahren

ISAP auf CD-ROM  
Bibliothek für Bauunternehmer auf elektronischen Wegen  
BOUfire rationalisiert die Anwendung des Feuercodes

### Kommerzielle Sicherheit

ACL "Umzäunung" ist ein Welthit  
Sicheres Datenübermittlungsnetz  
Die optische Verbindung

### Gesundheit und Sicherheit

Das Ankiörper-Projekt  
CAPMAP macht Konservierungsmittel überflüssig  
Wir setzen einen Deckel auf Staubexplosionen

### Energie

Wibelschicht-Trockner  
Das Isosynthese-Projekt

**THE CSIR'S 13 DIVISIONS**  
and their central telephone numbers

Building Technology

(012) 841-3871

Earth, Marine and Atmospheric Science and Technology

(012) 841-4111

Energy Technology

(012)841-4946

Food Science and Technology

(012) 841-4555

Forest Science and Technology

(012) 841-2620

Information Services

(012) 841-2000

Manufacturing and Aeronautical Systems Technology

(012) 841-2780

Materials Science and Technology

(012) 841-4392

Microelectronics and Communications Technology

(012) 841-2754

Mining Technology

(011) 726-3020

Roads and Transport Technology

(012) 841-2905

Textile Technology

(041) 53-2131

Water Technology

(012) 841-4479

**Specialist Services**

Technology for Developing Communities

(012) 841-4271

Environmental Services

(012) 841-3854

**Overseas Offices:**

Bonn

Tel: 228-36-3047 Fax: 228-36-2971

London

Tel: 71-495-1455 Fax: 71-839-3480

Washington

Tel: 202-362-8805 Fax 202-362-0785