



1994

CSIR

**TECHNOLOGY
IMPACT**

CSIR TECHNOLOGY IMPACT 1994

MISSION STATEMENT

The CSIR's business is to perform research and development to gain technology and thereafter ensure its implementation in order to:

- be the technology partner of South African industry in both the formal and informal sectors to promote economic growth –

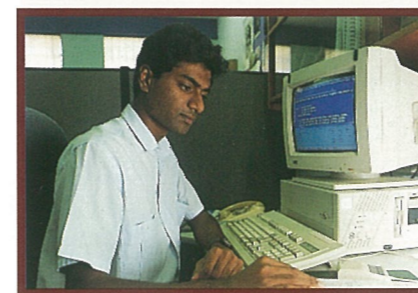
TECHNOLOGY FOR COMPETITIVENESS

- provide technology solutions that improve the quality of life in urban and rural developing communities –

TECHNOLOGY FOR DEVELOPMENT

- provide scientific and technological support to enhance decision-making in the public and private sectors –

TECHNOLOGY FOR DECISION-MAKING



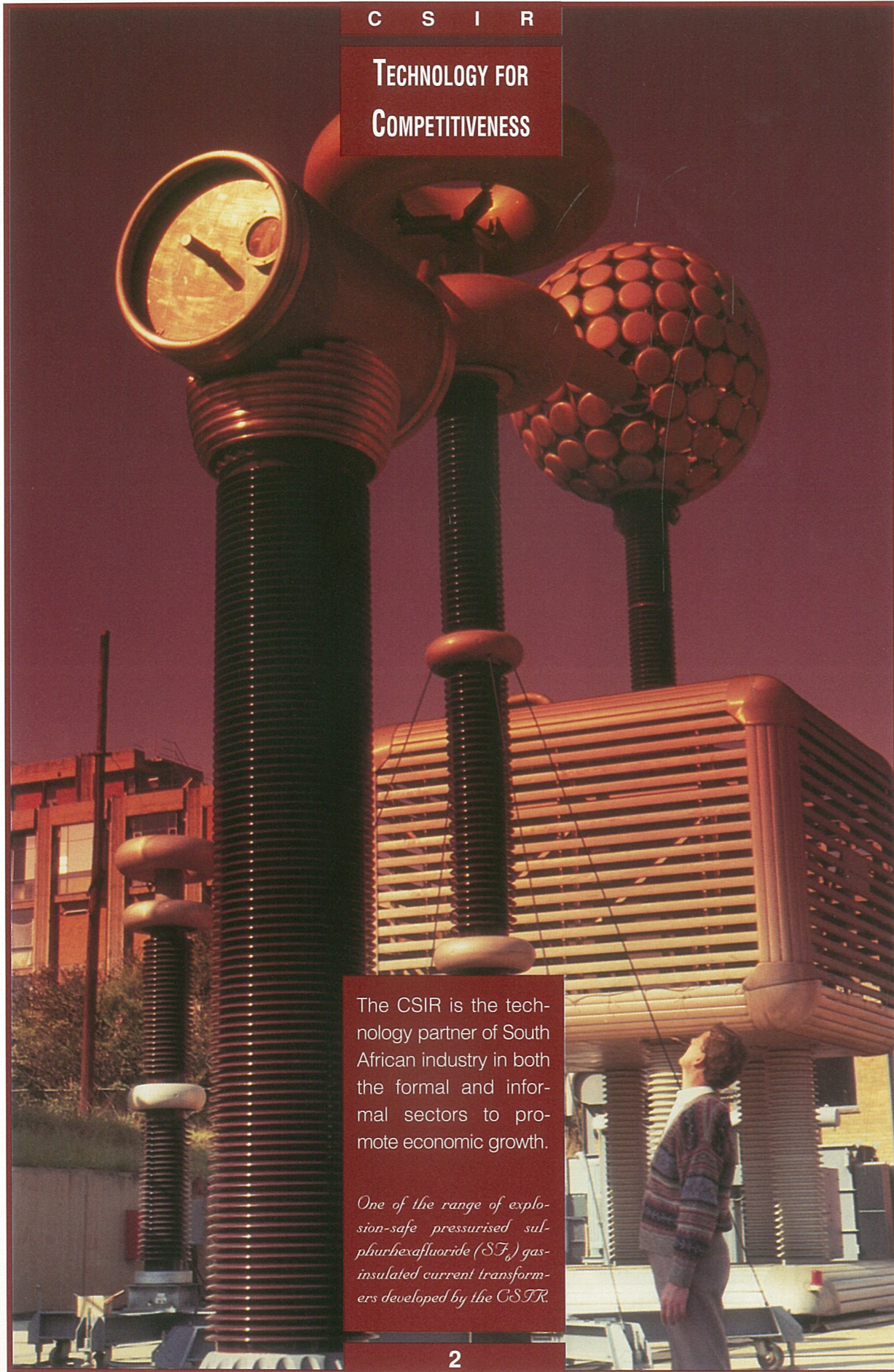
CONTENTS

TECHNOLOGY FOR COMPETITIVENESS	2
TECHNOLOGY FOR DEVELOPMENT	12
TECHNOLOGY FOR DECISION-MAKING	20
SOME OTHER PROJECTS	28

Co-ordination: CSIR Marketing Services
 Design, production, printing: The Penrose Press
 ISBN 0-7988-5327/1 June 1994
 CSIR, PO Box 395, Pretoria 0001
 Tel: (012) 841-2220 Fax: (012) 841-3789

C S I R

TECHNOLOGY FOR
COMPETITIVENESS



The CSIR is the technology partner of South African industry in both the formal and informal sectors to promote economic growth.

One of the range of explosion-safe pressurised sulphurhexafluoride (SF₆) gas-insulated current transformers developed by the CSIR.

SUPERTAG

Unprecedented international interest has been created by the CSIR's internationally patented electronic tagging system, Supertag. The ultimate goal is to incorporate a minuscule transponder tag in the packaging of consumer items at very low cost as a replacement for barcodes. What makes the CSIR system totally unique is that it includes protocols to allow for many tags to respond simultaneously to "interrogation" by a reader. The system, which is being licensed internationally by the British Technology Group Limited (BTG), allows many items of the same type, with the same case or product number, to be counted without the need for serial numbers.

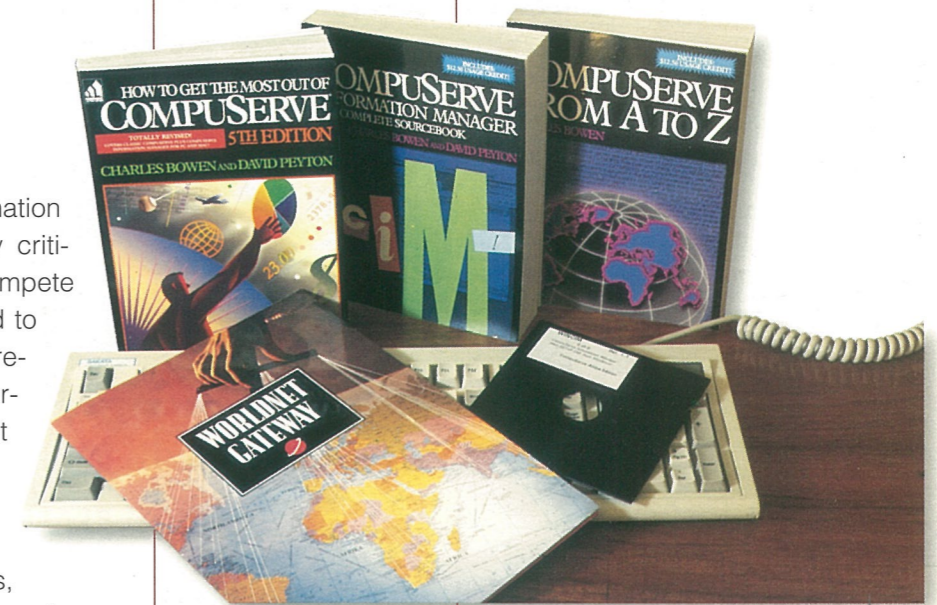
INTEGRATED
BUSINESS
INFORMATION
SYSTEMS

Access to relevant information is becoming increasingly critical in business. To compete globally, companies need to be able to rely on comprehensive, up-to-date information. During the past year the CSIR has, based on the electronic information service made available over the years, developed the concept of an Integrated Business Information System. This system is based on the electronic and other information needs of organisations, such as electronic trading and electronic communication. The National Integrated Business Information System (NIBS) allows for a business directory, product and service catalogues and EDI-based

C S I R

TECHNOLOGY FOR
COMPETITIVENESS

business transactions. To cater for organisations' need for electronic communication, NIBS provides for forums and bulletin board services, electronic mail interconnectivity, news services and real-time access to local and international reference databases. NIBS gives access to international forums via CompuServe, one of the world's largest personal information and communication networks, encompassing 2 000 different services and more than 450 forums. A joint venture has furthermore been signed between the CSIR and Omnilink that opens NIBS up to Internet, the largest and fastest growing network in the world. NIBS provides data base access and document delivery through the CSIR's Worldnet Gateway Service. This service gives



The National Integrated Business System (NIBS) gives access to international forums via CompuServe and provides data base access and document delivery through the CSIR's Worldnet Gateway service.

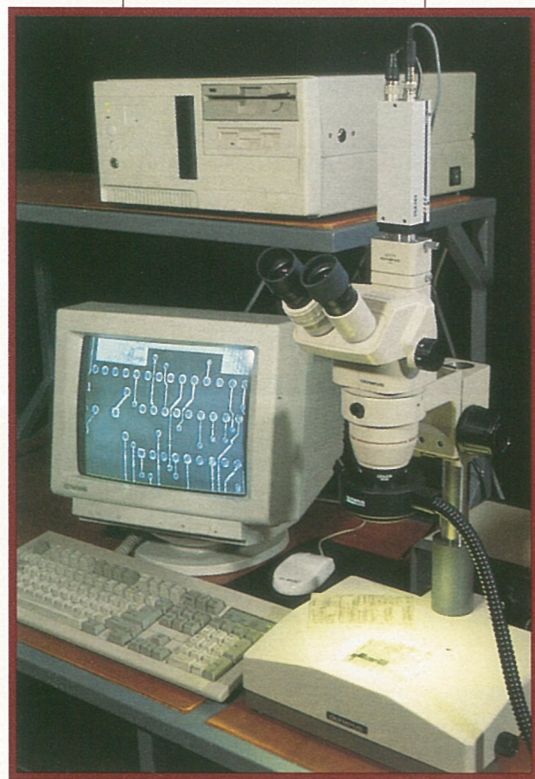
clients electronic access to more than 1 000 local and international data bases. NIBS will undoubtedly be a key information services delivery mechanism for companies operating in all business sectors and notably for those companies operating in reconstruction and development initiatives in South Africa.

MACHINE VISION

The CSIR has refined machine vision technology to the extent that throughput and productivity can be improved. Machine vision offers the manufacturer faster production throughput and more consistent quality. These benefits are achieved by automated measurement systems which give high repeatability, reliability and accuracy, and hence reduced material wastage. Operator productivity is improved as repetitive and monotonous operations are mechanised. Processing is optimised, as causes of bottlenecks and poor quality can be identified and eliminated. There is a reduced need to have an experienced, decision-making operator, resulting in more flexible staffing. Machine vision offers the ability to identify micro-sized items or faults which are difficult to detect with the naked eye, and to apply off- or on-line statistical analysis to the stored production results to comply with quality management standards, e.g. ISO 9000. The results can be used to provide traceability and prove conformance, to improve asset control and security of resources, and to improve process effectiveness through the ability to make new or improved process measurements.

ROCKBURST PROPS

Rockburst props developed to revised specifications by COMRO (the Chamber of Mines Research



The CSIR's Machine Vision technology offers automated measurement of manufactured items to give high repeatability, reliability and accuracy.

4

C S I R

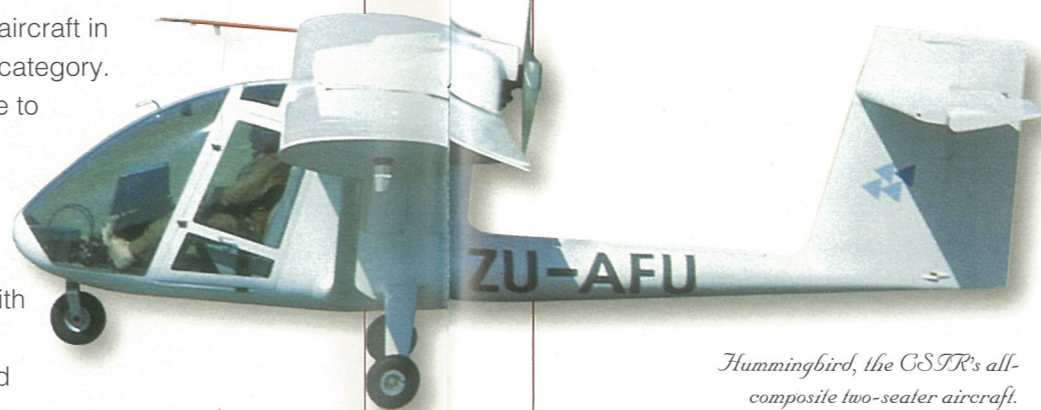
TECHNOLOGY FOR COMPETITIVENESS

Organisation), which became part of the CSIR in 1993 as its Division of Mining Technology, gained increasing acceptance in 1993. Currently some 50 000 units are used by the mining industry. The specifications, finalised in 1991 as part of a research programme sponsored co-operatively by the South African gold mining industry, enable the props to accommodate closure velocities of up to 3 m per second in the event of a rockburst. They additionally incorporate a low slow-yield valve, which is required during the greater part of the prop's lifespan. This low force prevents damage to the hanging wall and the prop, and enables the props to be designed with a significantly lower mass for easier handling in the stopes. They not only help prevent rockburst damage, but also rockfalls close to the face where most activity takes place.

HUMMINGBIRD: ALL-COMPOSITE

AERIAL OBSERVATION PLATFORM

Hummingbird is a two-seater light aircraft in the FAR 23 category. While simple to operate, it has excellent low-speed performance with outstanding air-to ground visibility. The



Hummingbird, the CSIR's all-composite two-seater aircraft.

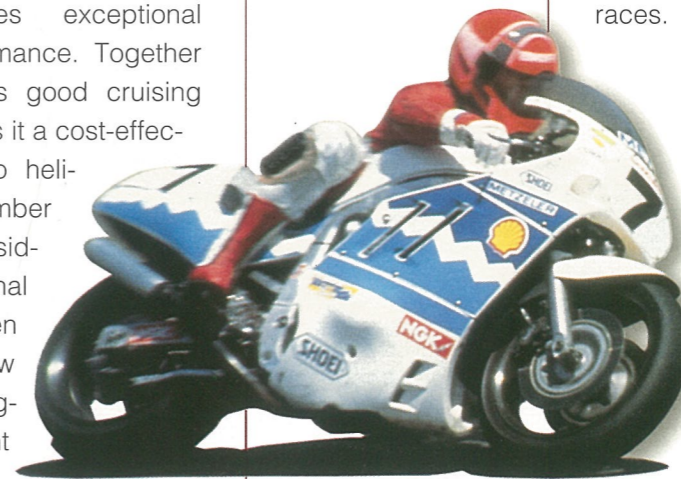
all-round helicopter-style vision and low operating costs associated with fixed-wing aircraft make Hummingbird extremely attractive for all types of low-level, low-speed aerial observation tasks. The aerodynamic design has achieved a very stable platform in the low-speed regime. This feature facilitates exceptional short-field performance. Together with the aircraft's good cruising speed, this makes it a cost-effective alternative to helicopters in a number of functions. Considerable international interest has been shown in this new product. Hummingbird is at present undergoing rigorous flight testing for certification.

COMPOSITE MATERIALS MOTORCYCLE WHEEL

The license for the manufacture of the CSIR's special composite carbon fibre motorcycle wheel has been sold for R1 million to a local company. Marchesini, an internationally renowned leader in Grand Prix motorcycle racing, has accepted the wheel as part of its product range. The wheel now bears the Marchesini stamp of

C S I R

TECHNOLOGY FOR COMPETITIVENESS



The CSIR's composite materials motorcycle wheel is being tested by a number of international motorcycle racing teams.

5

approval, denoting a product that satisfies stringent quality requirements. The technology used in the construction of the new wheel is probably the most advanced of its kind in the world today. A number of international motor cycle racing teams are testing the new wheel for use in Grand Prix races.

NEW ABALONE HATCHERY/NURSERY AT HERMANUS

The CSIR's abalone hatchery/nursery at Hermanus is in the final stage of construction. The premises were constructed by Tuna Marine Limited

(an Oceana subsidiary) and are leased to the CSIR. The CSIR was responsible for the overall conceptual and detailed design of the hatchery/nursery as well as the installation of the intricate seawater supply and quality control systems. The CSIR will operate the hatchery/nursery through its commercial proving stage, after which it will be offered for sale. Operational management focuses on adult conditioning, spawning, larval rearing and settlement through weaning within economic constraints. The CSIR took occupation of the building in April 1994 and the seawater supply was commissioned in the first week of May. Commercial quantities of abalone juveniles (8 - 12 mm) will be produced in the system from September this year. These will supply an abalone culture industry that has the potential to earn more than R15 million in foreign exchange per year.

KANGELA

"SNIFFS" OUT ASH

Continuous control of the ash content in mined coal in order to eliminate less efficient coal can prove problematic. An accurate, non-contacting and fast on-line instrument is ideally needed to measure coal quality. In collaboration with the Atomic Energy Corporation (AEC), the CSIR has developed the Kangela on-line ash monitor, marketed by Hartmann and Braun. Ten units have already been sold. The name Kangela means "to observe" or "to find out". It is an all-South African design consisting of a C-frame positioned over the coal belt. Low-energy transmission nuclear sources measure the ash content as the coal passes over the source holder, and compensate for density variations.

ALTERNATIVE TECHNOLOGIES REDUCE COSTS OF ROAD BUILDING

Using accelerated road testing, the CSIR evaluated the use of granular emulsion mixes (GEMS) on a road section in the Orange Free State. The use of this technology, which upgrades sub-standard road-building materials to an acceptable quality, resulted in a saving of approximately R30 000/km over the use of a conventional crushed stone base. The research results of this project as well as those of large stone aggregate mixes (LAMBS) and porous asphalt, all undertaken for the Southern African Bitumen and Tar Association (Sabita), have been published in guideline manuals. The manuals promote the use of these materials as cost-effective alternatives which at the same

C S I R

TECHNOLOGY FOR COMPETITIVENESS

time improve road safety conditions. In the first eighteen months of implementation, contracts in excess of R100 million based on these technologies have been approved.

FIBRE PUFFS

The CSIR is one of only seven organisations in the world to develop technology for the manufacture of fibre puffs used as filling in pillows, duvets, cushions, upholstery, soft toys and other filled products requiring softness and resilience. Fibre puffs, developed to simulate down, encapsulate air very effectively. This enhances the thermal properties and comfort of the material and makes the filling lofty and light. It is highly desirable that pillows should show only a slight increase in "hardness" after washing, which is caused by matting or consolidation of filling material. In comparative tests, the CSIR puffs consistently out-performed other puffs in static as well as dynamic resistance to compression.



The CSIR has developed the technology for the manufacture of fibre puffs for use as a soft, resilient filling material.

6

HELICOPTER FILTERS

The CSIR has, with the Atomic Energy Corporation (AEC), developed and evaluated advanced helicopter filters based on vortex-tube technology for both the Bell 206A/B JetRanger and the Alouette SA 316B helicopter. The AS18 vortex tube which is used in the system has shown an exceptionally high filtration efficiency of up to 96 per cent, which is between three and ten times better than that of any other such tube on the market. It gives superior engine protection especially under South African conditions where the silica content of dust can be up to 100 per cent in places. The system is self-cleaning and requires a minimum of logistical support.

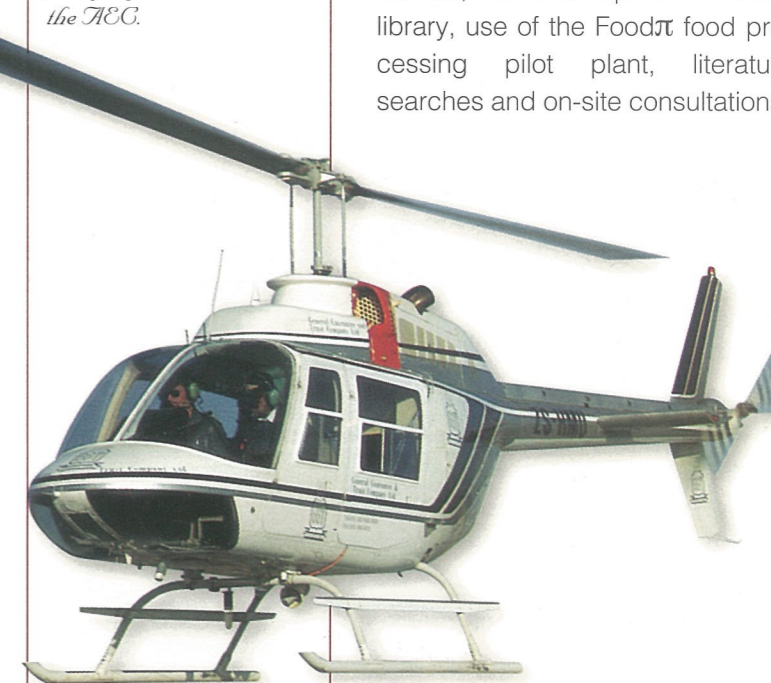
FIRE RETARDANT FOR THATCH

An innovative fire retardant for the protection of cellulosic materials such as timber products and wood derivatives has been developed and patented internationally by the CSIR. The retardant consists of a water-based solution of fire-retardant chemicals with an intumescent polymer emulsion which provides a two-fold protection mechanism. The technology has been proved successful in the protection of mining timbers and thatched roofs and is achieving wide acceptance in the South African market. Product development is continuing for other applications. The retardant can be applied by brushing, spraying, dipping or by pressure impregnation. It has major performance and cost advantages over other fire-protective coatings for timber.

C S I R

TECHNOLOGY FOR COMPETITIVENESS

A helicopter equipped with the advanced filter for engine protection developed jointly by the CSIR and the AEC.



FOODSTAR

MEMBERSHIP SCHEME

The FOODSTAR scheme provides companies in the food industry with an opportunity to expand their access to information and technology, and to benefit from the back-up available from the CSIR. Subscribing members are offered a comprehensive package which includes a telephone consultation service, membership of the CSIR library, use of the Foodπ food processing pilot plant, literature searches and on-site consultations.

NOVEL MEMBRANE FUNCTIONS AS ARTIFICIAL SKIN

The CSIR's Polymers Group has developed a novel burn-wound dressing, which functions as an artificial skin, in a joint venture with the Medical Research Council. The technology has been sold to Adcock Ingram Pharmaceuticals for commercialisation. The development of the artificial skin membrane was made possible by the knowledge of various hydrogels and polymer materials and their methods of preparation. It is flexible, strong and easy to handle,

7

can be draped smoothly over a wound surface and can be removed with very little cell damage. It is relatively inexpensive, and has an uncomplicated production procedure. The established properties of the new product provide the medical profession with a new tool for the optimum treatment of burn wounds and other skin ailments. The material is currently being evaluated in early-stage clinical trials.

RESIN TRANSFER MOULDING

Resin Transfer Moulding (RTM) is a process which is gaining momentum world-wide. The CSIR, in association with local clients, is involved in the development of technology to assist industry in the implementation of RTM. As a closed-mould process, which produces high-quality fibre-reinforced plastic (FRP) or composite products, RTM is ideally suited to be implemented in a production-line process. Composite material products are replacing traditional metal-based products at an ever increasing rate. RTM requires a smaller investment than other composite processes and is therefore ideally suited for the mass production of products ranging from high-technology aerospace applications, high-quality automotive body parts, and commercial items for the building industry right through to sporting goods such as bicycles, racquets and large boats. Although RTM is a technologically advanced process, it is ideally suited for the smaller enterprise which supplies high-value

C S I R

TECHNOLOGY FOR COMPETITIVENESS



LIGHTNING COURSE PRESENTED IN ZIMBABWE

The CSIR's special course on lightning protection of electronic equipment was presented outside South Africa for the first time from 31 January to 1 February 1994 in Zimbabwe, in co-operation with the University of Zimbabwe. The course was well received by the delegates and a repeat presentation is planned for November – the peak lightning period in southern Africa.

components to a larger integrating manufacturer. The RTM process provides a high-quality and repeatable part with smooth surfaces on both sides.

ACID AND CAUSTIC SODA RECOVERY

Spent acid and caustic soda effluent is produced by the metal pickling, brewery, dairy and beverage industries. Wastes from these industries can cause serious pollution of water resources, and at the same time expensive chemicals

are lost when effluents are treated with chemicals prior to discharge in the conventional way. The CSIR has evaluated diffusion dialysis and bipolar electro-dialysis, two processes that can be used to recover acid from spent acid effluent. Novel reverse osmosis membranes can be used to recover caustic soda effectively. Implementation of these technologies in industry will lead to reduced water pollution and the recovery of expensive chemicals.

ODOUR CONTROL SYSTEMS

Traditionally, industrial facilities generating unpleasant odours have been established away from human habitation to minimise their nuisance value. Examples of these are wastewater treatment facilities, sewage pumping stations, landfills, abattoirs, rendering plants, fishmeal and food processing plants, tanneries and paper mills. However, population growth has led to urban development in the

vicinity of many of these industries. Nuisance odours from smelly industries can now be eliminated cost-effectively. The CSIR has developed a range of biological odour control products to replace physical-chemical systems and imported biological products which are expensive to operate and maintain. Following pilot trials, the products were launched last year and six of the biological systems have been successfully installed. Biwater has been appointed as the CSIR's agent to market the products in South Africa.

CSIR WORK ACCLAIMED IN CALIFORNIA

The CSIR's accelerated pavement testing technology emerged with accolades from a study to assess the efficacy of thin-layer bitumen-rubber asphalt as an alternative to conventional thick-layer asphalt for the California Department of Transport (CalTrans). The CSIR's Heavy Vehicle Simulator (HVS) tested special test sections built in South Africa according to California design methods and specifications. A climatic chamber was designed and built to control road surface temperature. Results were supported by information from the HVS data base which contains two decades of HVS test results and is one of the most comprehensive of its kind in the world. The study proved the alternative technology to be significantly more cost-effective, thus having an important impact on CalTrans' policies.

C S I R

TECHNOLOGY FOR COMPETITIVENESS



A pavement study was done for the California Department of Transport to assess the efficacy of thin-layer bitumen-rubber asphalt.

DELANCO KILNS

New low-cost progressive and compartment-type timber drying kilns have been developed by the CSIR to enable the small to medium-sized sawmiller to produce quality dried timber at an affordable cost. A joint venture agreement has been concluded with a local manufacturer, Delanco Cooperative Ltd. The agreement makes provision for Delanco to produce and market, on an exclusive basis, low-cost, compact kilns with a timber volume of less than 40 m³, drawing upon the technology developed by the CSIR.

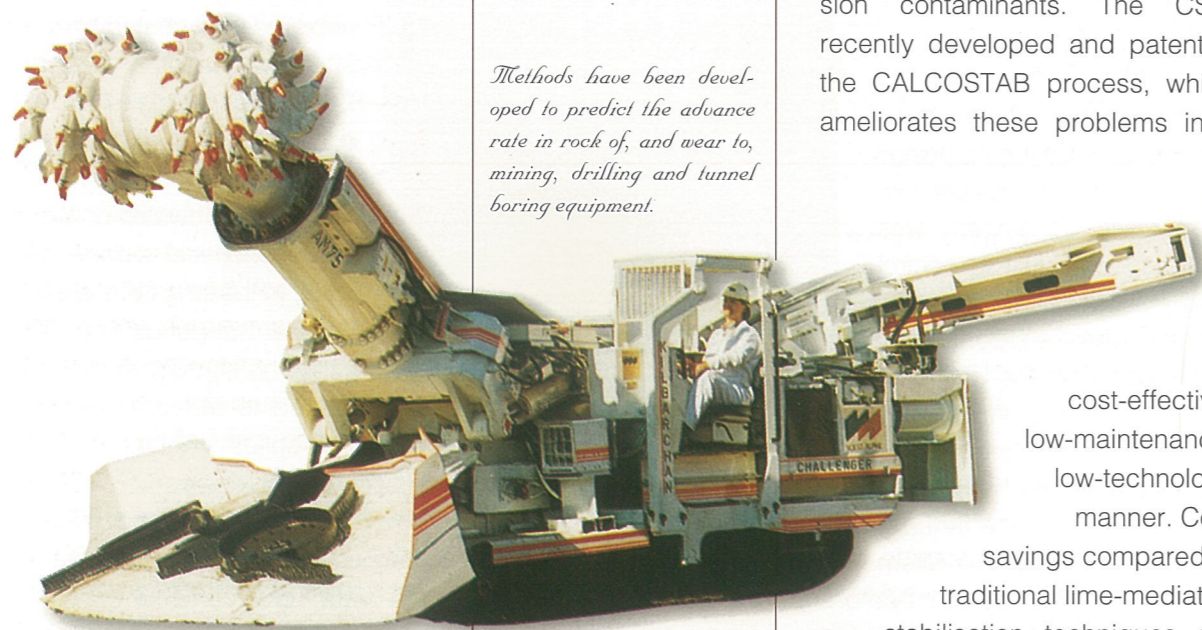
ELECTRICALLY ASSISTED SLUDGE DE-WATERING TECHNOLOGY

In view of increasingly stringent environmental regulations, it is imperative that as much water as possible be removed from treated domestic and industrial sludge. This gives a higher solids content for product recovery, energy savings, prevention of groundwater pollution and economical sludge disposal. In the long term, sludge disposal depends on the ability of sludge to be de-watered to at least a 30 per cent solids content prior to beneficial re-use. The CSIR has developed and patented electro-osmotic technology in fulfilment of the new environmental requirements. Owing to a globally increasing content of domestic and industrial sludge, it is planned

to market electro-osmotic de-watering technology not only locally but also in Europe and the UK where sludge dumping at sea must be discontinued by 1998.

PREDICTING THE PERFORMANCE OF ROCK-ENGAGING MACHINERY

Time and money can be saved if the advance rate in rock of, and the wear to, mechanised mining, drilling, raise-boring, tunnel-boring and earth-moving equipment can be determined in advance. These parameters can be predicted, based on methods developed internationally and by the CSIR. A major concern is the calculation of time and cost schedules. This process can be simplified and made more accurate if key performance aspects of rock-cutting machinery to be used on the project are known in advance, such as: the average likely advance rate; replacement frequency of



Methods have been developed to predict the advance rate in rock of, and wear to, mining, drilling and tunnel boring equipment.

TECHNOLOGY FOR COMPETITIVENESS

cutters/picks; and the optimum angle of attack and spacing of cutting tools. Answers to these and other questions reduce the risks associated with the selection of the correct rock-engaging equipment. Cost and advance rates can be estimated by contractors for tendering, operations can be scheduled and parts replacement can be planned, and rock-engaging equipment can be developed. The CSIR provides this service by using a series of testing facilities to determine the cutability, boreability, drillability, crushability and abrasiveness of rock.

STABILISATION OF AGGRESSIVE AND CORROSIVE WATERS

Low pH, aggressive and corrosive waters in South Africa not only cause damage to reticulation networks and household systems estimated to be in the hundreds of millions of rand per annum, but also result in the deterioration of water quality as a result of corrosion contaminants. The CSIR recently developed and patented the CALCOSTAB process, which ameliorates these problems in a

cost-effective, low-maintenance, low-technology manner. Cost savings compared to traditional lime-mediated stabilisation techniques are as high as 70 per cent. The CALCOSTAB process has at

present been developed for a range of applications varying from household to municipal-size installations. Current research is concentrated on developing the system for large city-size water supply authorities.

SILK, THE QUEEN OF TEXTILES

The CSIR has succeeded in converting wild and cultivated silk into spun yarn and other spun silk products. Following extensive trials to perfect the de-gumming process and optimise the opening, carding and spinning of the fibre, the CSIR, through incubation and product development runs, has successfully produced a wide range of end products. Silk noil, as a by-product of the spinning process, can be utilised as a duvet-filling material, and is also blended with various other fibres to create special-effect yarns. The CSIR has also developed a machine to cut open cocoons and dispose of the pupae.

BACKFILL ADVISORY SERVICE

The CSIR's backfill advisory service arose from the research programme which investigated all aspects of backfill for the gold mining industry, from designing suitable backfill materials, through system design to the commissioning and auditing of working systems. The advisory area has expanded significantly and now covers services in other types of

TECHNOLOGY FOR COMPETITIVENESS



A process has been developed to convert wild and cultivated silk into spun yarn and other spun silk products.

mines, such as base-metal mines, and in mines in other countries including Zaire and Canada. The hydrotransport expertise of the service is being increasingly applied in other fields.

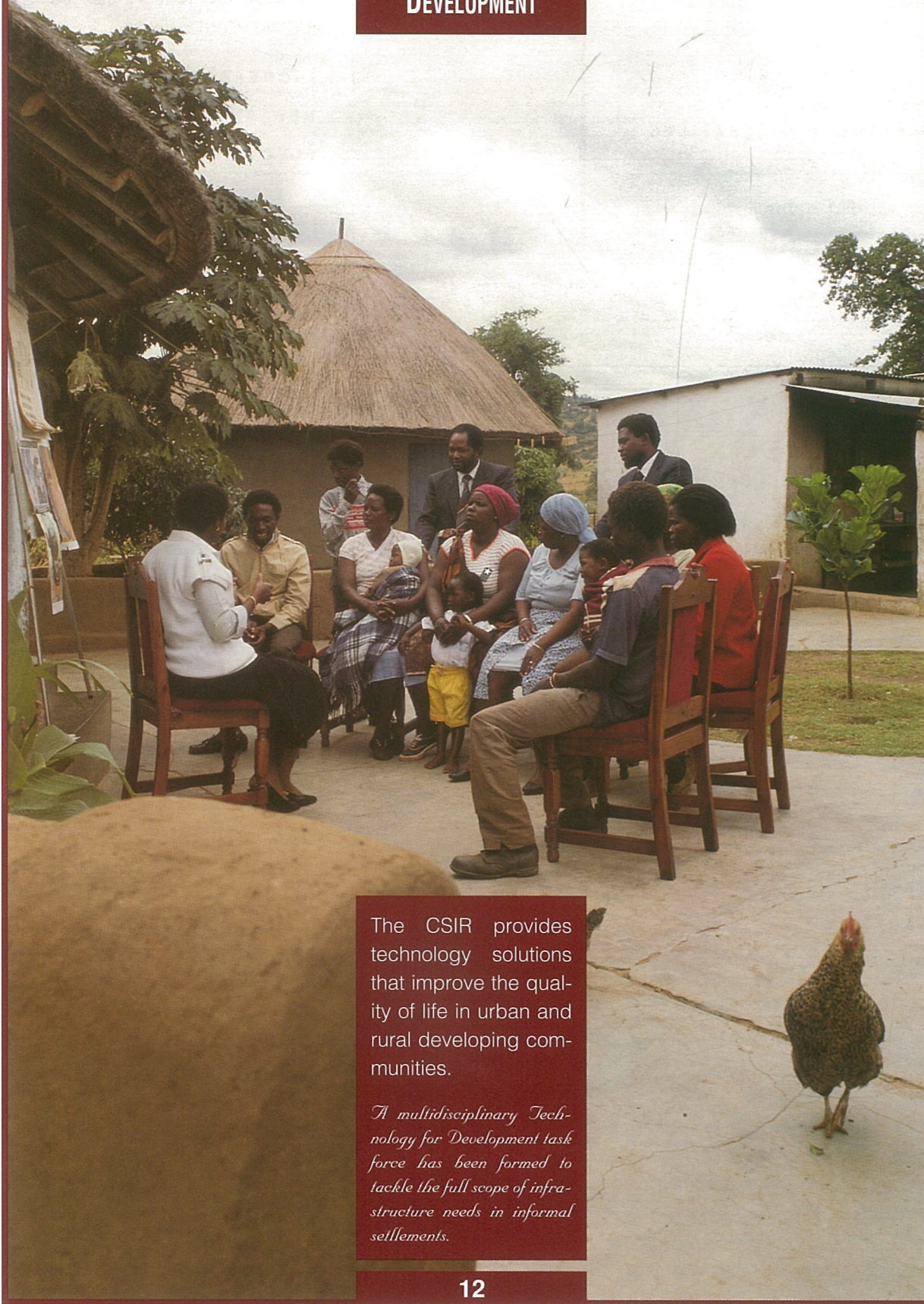
INCREASED SAFETY FOR NEW AND EXISTING HV ELECTRICAL EQUIPMENT

Type tests on the CSIR's range of explosion-safe pressurised sulphurhexafluoride (SF₆) gas-insulated current transformers rated at 400, 275, 132 and 88 kV have been completed and the first units have been delivered to Eskom for field tests. These

products were designed for new substations and are aimed at replacing the old oil-paper-insulated equipment. In addition to this new range of high-voltage current transformers, the CSIR has, in close co-operation with the Johannesburg Municipality, developed a second product for combating the explosion hazard posed by oil-paper-insulated high-voltage equipment. For oil-paper-insulated HV equipment which has already been in service for years and where replacement is not warranted at this stage, the CSIR has launched a product for continuous on-line condition monitoring of the insulation. In order to avoid explosions due to insulation failure, these systems provide early warning signals of rapid degradation of oil-paper insulation. Field tests are providing positive results.

C S I R

TECHNOLOGY FOR DEVELOPMENT



The CSIR provides technology solutions that improve the quality of life in urban and rural developing communities.

A multidisciplinary Technology for Development task force has been formed to tackle the full scope of infrastructure needs in informal settlements.

INTERACTIVE PLANNING FOR COMMUNITY FACILITIES

The CSIR's multidisciplinary Technology for Development (TFD) task force draws on the relevant expertise of various CSIR divisions and works closely with communities to provide holistic solutions for the infrastructural needs of communities in townships and informal settlements. These needs include housing, roads, energy, health, education, refuse disposal and recycling, water purification and reticulation, sanitation, and stormwater management. The environmental and social impacts of these development activities are also addressed by the task force.

SMALL-SCALE POULTRY ABATTOIRS

Very low-cost, hygienically acceptable abattoirs that will satisfy communities' specific requirements are being developed by the CSIR, and will be established as operating pilot businesses. The project is based on the combination and adaptation of existing technologies to provide the best basis for a profitable and sustainable business. A major part of the

C S I R

TECHNOLOGY FOR DEVELOPMENT



Low-cost, hygienically acceptable abattoirs are being developed and will be operated as pilot businesses.

technology will be quality, safety, and operations systems, including manuals and training that will form the basis of a franchising package. This package will be supported by a similar system on the business side.

ROAD NEEDS IN DEVELOPING AREAS ASSESSED

The CSIR won the 1993 Southern African Bitumen and Tar Association (Sabita) Research Award with a study of road needs in developing areas. The research was done as part of the Sabita social studies programme. This comprehensive research project reviewed the existing data on the South African road system, estimated the extent and condition of the road system in communities in urban and rural areas, surveyed the expectations of the public and associations, reviewed the norms for road provision in these areas, and assessed road needs for both vehicular and pedestrian traffic. Results showed that a vast network of unproclaimed roads exists, a considerable proportion of which needs to be developed in line with the Reconstruction and Development Programme.

KNITTING ACADEMY

The CSIR, with the support of the Department of Manpower, IDT, SBDC, Khanya Centre, and other community-based organisations, has successfully implemented a pilot project in Port Elizabeth aimed at stimulating job creation. The CSIR Knitting Academy is a one-stop technological aid centre which assists potential entrepreneurs with technical, marketing, and business management skills, training and support. This CSIR initiative has served as a project model and has played a pioneering role in the establishment of the larger Community Self-Employment Centre (COMSEC) of the Eastern Cape Regional Economic Development Forum to stimulate job creation.

METRO TRAIN

SECURITY SYSTEM

When the South African Rail Commuter Corporation (SARCC) commissioned Teljoy's manufacturing division, Provicom Industries, to develop and install a closed-circuit surveillance system on their envisaged security train, Provicom's engineers were faced with the daunting task of linking 14 independent train coaches together in a video, audio and data network. Provicom approached the CSIR to develop a custom solution to this unique problem. Provicom and the CSIR tested the first demonstration link on a train within three months of commencement of the project. The first of the SARCC prototype security trains is now in operation. The revolutionary optical system links the video signals from 56 cameras together with all audio signals and all the control data of the security system.

C S I R

TECHNOLOGY FOR DEVELOPMENT



The CSIR Knitting Academy in Port Elizabeth teaches technical and business management skills.

14

WIND-TUNNEL

INVESTIGATION ASSISTS ARCHITECTS AND DEVELOPERS

A community-based project to upgrade the Nyanga railway station in Guguletu was recently undertaken by one of the leading architectural firms in Cape Town. The CSIR was asked to do wind-tunnel tests to assist the developers and architects with the optimal layout and form of the building, to identify potentially uncomfortable or dangerous spots, and to introduce remedies to ensure the full utilisation and community acceptance of the facility. Nyanga is a very busy railway station with a daily turnover of more than 50 000 people. Its development is being funded by a consortium of local black entrepreneurs, and is proving to be a fine example of co-operation between the formal and informal sectors.

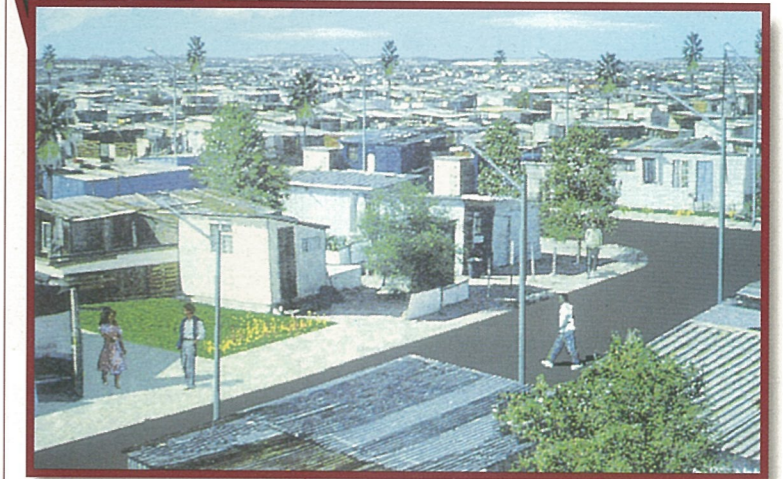
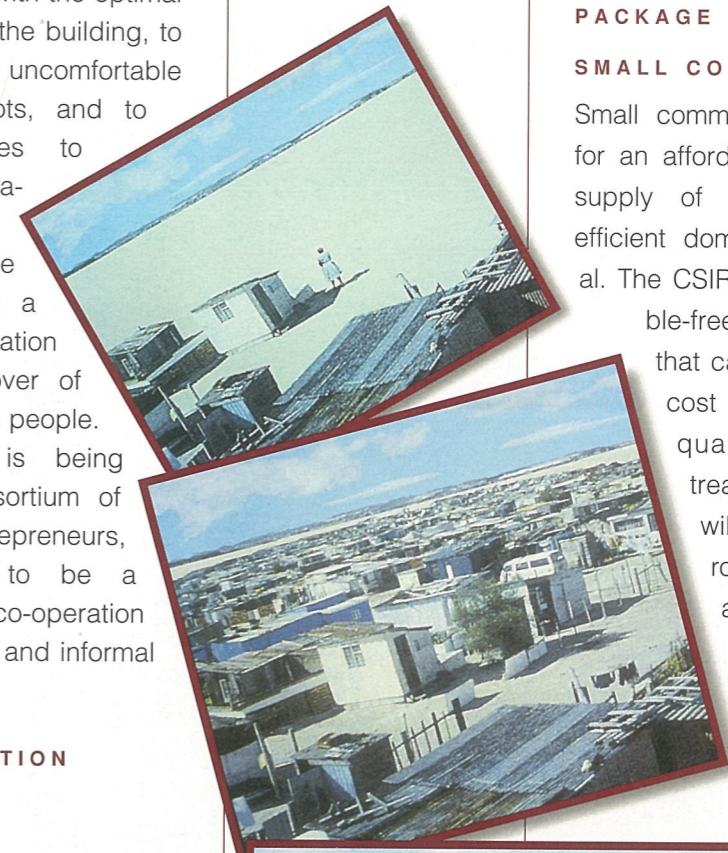
3-D VISUALISATION TECHNOLOGY

The CSIR has developed computerised decision support visualisation technology which can assist in any planning process dealing with the sustainable development of low-income urban areas and the environment. The technology involves the creation of three-dimensional structures to any scale and degree of complexity, their fusion into scanned site-photographs, sophisticated image processing, 2-D and 3-D animations and output to different

C S I R

TECHNOLOGY FOR DEVELOPMENT

The CSIR's computerised decision support visualisation technology allows active participation of communities in the sustainable development of low-income urban areas.



15

media such as hard-copy, digitised or video format. The technology is particularly suitable for communicating complex spatial concepts. Its transportability makes it possible to project planning proposals onto a large screen, allowing the active participation of communities and so ensuring their empowerment to make decisions that affect their lives.

WATER TREATMENT

PACKAGE PLANTS FOR SMALL COMMUNITIES

Small communities have a need for an affordable and acceptable supply of drinking water and efficient domestic sewage disposal. The CSIR has developed trouble-free treatment packages that can be installed at low cost to produce high-quality drinking water or treated wastewater that will not pollute the environment. The major advantages of these plants are that they require a minimum

of operator time and maintenance, and can easily be transported to, and installed at, any remote site. The plants integrate proven treatment technologies and compact treatment systems. The design is modular to allow customising and easy extensions. A variety of surface and groundwaters, including waters with high concentrations of iron and manganese, algae and organic colour can be treated.

BIOMASS INITIATIVE

Plant for Life, as the Biomass Initiative is commonly called, is a CSIR project funded by the Department of Mineral and Energy Affairs that relates to the role of fuelwood and energy supplies for rural South Africa. Backlogs in electricity supply to rural areas will take years to overcome, and even then people will continue to use wood, at least for cooking. The National Biomass Initiative aims, through trials and research, to develop a policy to ameliorate the fuelwood and environmental crisis in rural areas. This involves evaluating different approaches for instituting community-run nurseries for the supply of trees to rural communities.

QUICKPRESS FOR EASY SLUDGE DE-WATERING

The CSIR has developed a device that can easily and effectively de-water the sludge produced as a waste product from small-scale domestic sewage treatment plants. Handling and disposing of the sludge produced by plants in rural villages, informal settlements, schools and holiday resorts has up to now been a major concern,

C S I R TECHNOLOGY FOR DEVELOPMENT



The National Biomass Initiative aims to develop a policy to ameliorate the fuelwood crisis in rural areas.

as improper disposal of the sludge causes numerous problems for the community, including odours, flies and pollution of water sources. The Quickpress provides a solution to these problems. The pressure filter can de-water sludge rapidly to produce a spadeable substance that can be used for beneficial applications such as composting or direct land application. The filtration device is easy to operate, and requires a minimum of operation. It has many applications in small communities and institutions.

BRAAICHR

The Braaichar process defines a new processing concept for biomass fuels, creating a useful fuel from agricultural wastes. It introduces favourable new properties and thereby adds value. The process entails product treatment within well-defined thermal conditions. The product is water-resistant, and serves as a carbonised fuel with smokeless combustion (suitable for a "braai" or barbecue) and a high mass recovery of 70 per cent as opposed to only 10 per cent for charcoal. The novelty of the concept has been confirmed and a South African patent has been awarded to the CSIR. Confirmation on application in Malawi has also recently been confirmed. One company, Vaalharts Co-operative, has already been licensed to use this technology to add value to wastes from their peanut shelling operations.

DATA BASE FOR COMMUNITY DEVELOPMENT

The Technology for Development (TFD) team of the CSIR compiled

in a single data base the organisation's decades of experience in development activities in community settings, especially those related to community infrastructural needs. The data collection process sensitised staff not traditionally involved in development projects to ways in which they can contribute to the TFD thrust in the CSIR, particularly with a focus on wealth creation. The data base is available in hard copy or electronic format and includes about 130 project areas from the divisions ranging from "affordable housing" to "yarn for hand weavers". The data base will be regularly updated and serves to introduce the CSIR's capabilities to entrepreneurs, funders, NGOs, and others.

KWANYUSWA AND RELATED COMMUNITY PROJECTS

A Development Services and Technology Programme was established by the CSIR to focus specifically on the needs of communities. The success of community involvement in the planning, design and implementation of community schemes has been confirmed by a water supply scheme at KwaNyuswa in the Ndwedwe District of KwaZulu/Natal. This followed a successful CSIR water supply project at the KwaHlope village in Ndwedwe. The neighbouring village of Kwa-



The CSIR-designed water supply scheme at KwaNyuswa has demonstrated the success of community involvement in projects.

C S I R TECHNOLOGY FOR DEVELOPMENT

Nyuswa requested the CSIR to undertake a similar project in their community. The approach utilised by the CSIR was aimed at full community involvement and consequently a sustainable solution, owned and administered by the community.

Development activities driven by the community have proven to be workable by the success of water supply projects in KwaZulu/Natal and the Eastern Transvaal. All the projects were carried out by giving the communities full control and participation in the planning, implementation and labour-intensive construction phases of the projects. The people of the

communities were taught administrative, technical and entrepreneurial skills with the necessary controls to ensure that the Water Committee was fully accountable to the wider community and the funders. CSIR staff have developed the expertise to act as capacity builders, facilitators, specialist designers and trainers in such projects. Similar approaches are also being used in the fields of sanitation, energy, health education and irrigation.

CONSTRUCTION INDUSTRY INITIATIVE

As a result of the first Southern African Construction Industry Ini-

tiative project undertaken by a CSIR team, a Regional Council comprising representatives from the ten participating countries was formed to stabilise and promote coherent construction initiatives in the southern African region. The success of this project has positioned the CSIR as an important player in facilitating co-operation to enhance regional development of the construction industry.

LOW-COST OPTICAL TELEPHONE

The CSIR is currently involved in the development of a low-cost telecommunications system aimed at all high-density, low-cost housing areas where inadequate or no telephone services exist. Conventional systems do not address the needs of these communities adequately, and are too expensive to purchase, administer, install and/or maintain. The CSIR's low-cost system avoids the use of expensive copper wire or radio techniques but instead uses an inexpensive free-space point-to-multipoint infrared optical link between the subscriber and a central concentrator or exchange, mounted on a pole above the roofs of the community. A suitable interface then links the system to a conventional exchange.

GUIDELINES FOR STED SYSTEMS

The results of research, development and extensive monitoring of the performance of STED (Septic Tank Effluent Drainage) systems by the CSIR has culminated

C S I R

TECHNOLOGY FOR DEVELOPMENT



Water supply schemes developed by the CSIR assist in the upliftment of rural communities.

in the publication of a report containing guidelines for the design, use and maintenance of the systems under South African conditions. STED systems provide a viable and cost-effective form of sanitation particularly suited to affordable housing developments. STED is being used to an increasing extent, and a number of engineering consultants, operating under a licensing agreement with the CSIR, are designing and specifying such systems for new township developments.

INFORMATION SYSTEMS FOR DEVELOPMENT

The CSIR is currently expanding the use of the same infrastructure used for the National Integrated Business Information System (NIBS) to develop, together with other interested parties, information services in support of communities and entrepreneurial development (NIBS is discussed in the section Technology for Competitiveness).

GROUNDWATER FOR COMMUNITIES

A well-designed stormwater drainage system and a scientifically based water quality management strategy allow for the artificial recharge of urban stormwater runoff and treated domestic effluent to augment groundwater resources. Using this approach, CSIR hydrogeologists teamed up with the engineering company of Liebenberg & Stander to assist regional authorities to provide the West Coast town of Atlantis with a reliable supply of potable water

from underground. This low-cost approach to indirect re-use will ensure that water from the shallow aquifer will last well into the next century, delaying the introduction of costly surface water schemes. The development serves as a prototype for similar schemes in the arid western parts of South Africa.

TABLE VIEW RESCUED FROM BLOWN SAND

The construction of an artificial dune stabilised with non-invasive marram grass was part of a beach and dune management plan employed by the CSIR for "rescuing" Table View, Milnerton, from

C S I R

TECHNOLOGY FOR DEVELOPMENT

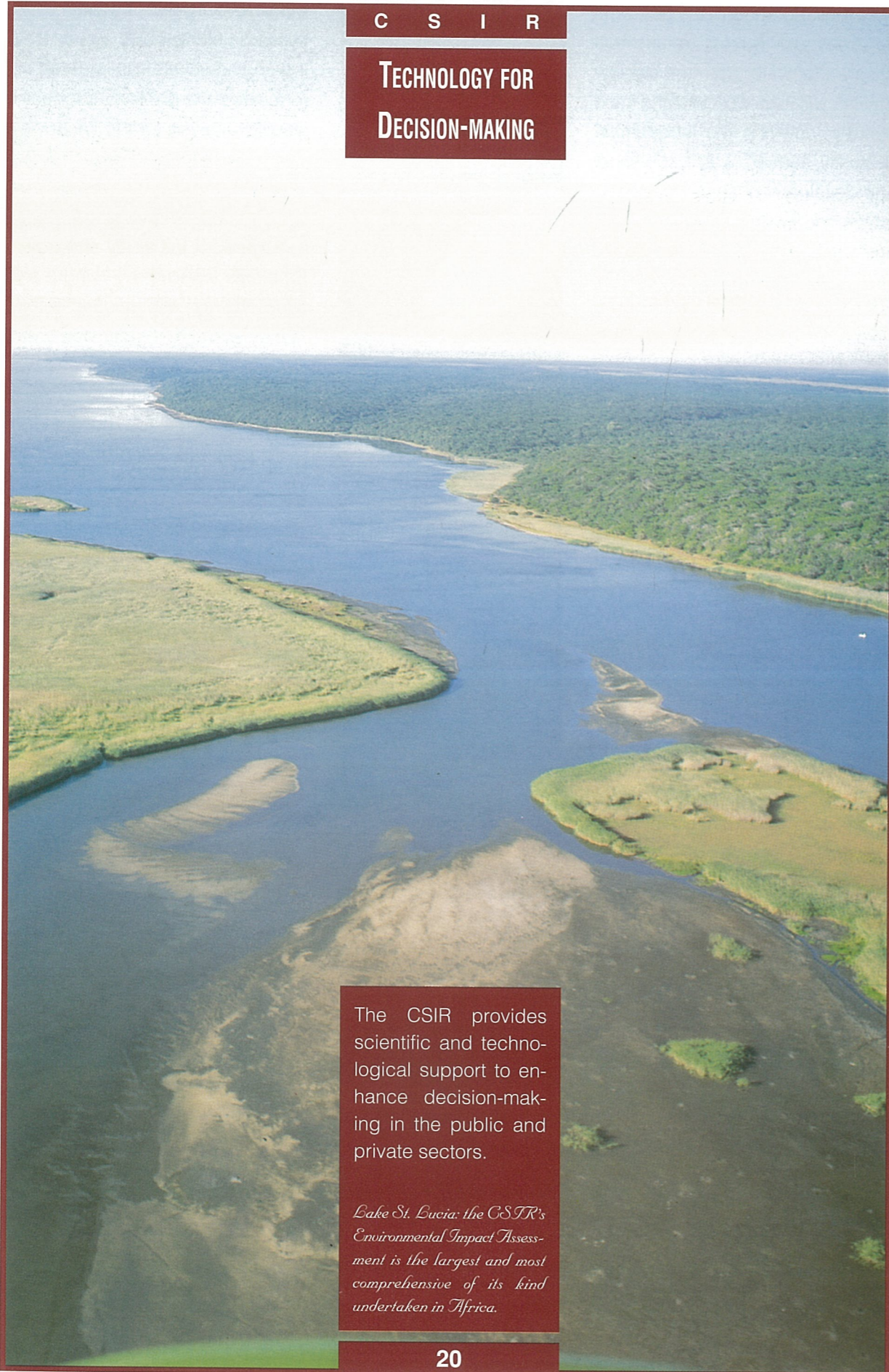
A storm-water drainage system allows groundwater resources to be augmented.



wind-blown sand invasion. The Milnerton Municipality and consulting engineers Hill Kaplan Scott Inc requested the CSIR to conduct a stability analysis for the Table View coastline and to make recommendations for the design and management of a vegetated dune. The need for the study arose from problems caused by wind-blown sand being experienced along Marine Drive. The sand was creating a hazard to motorists and was causing the Municipality to incur maintenance costs. The management plan has been successfully implemented.

C S I R

TECHNOLOGY FOR
DECISION-MAKING



The CSIR provides scientific and technological support to enhance decision-making in the public and private sectors.

Lake St. Lucia: the CSIR's Environmental Impact Assessment is the largest and most comprehensive of its kind undertaken in Africa.

THE ST LUCIA

IMPACT ASSESSMENT

In September 1993, the CSIR's Environmental Services completed an Environmental Impact Assessment (EIA) for the mining company Richards Bay Minerals (RBM) of two development proposals for the Eastern Shores of Lake St Lucia: the mining option, proposed by RBM, which included nature conservation and tourism as far as they may be accommodated while mining proceeds; and the nature conservation and tourism option, with no mining allowed, proposed by the Natal Parks Board. The EIA, the largest and most comprehensive study of its kind yet undertaken in Africa, was beset by a great deal of controversy. However, the Review Panel, appointed to make a recommendation to the South African Government on which land-use option to adopt, described the CSIR's Environmental Impact Reports as "... thorough, competent and highly professional" and stated furthermore that "...it would be difficult to envisage a more complex situation in which to conduct an EIA. Strong features of the study have been the recognition of this complexity, the commitment to objective, scientific analysis, and the commitment to research and data collection. Simulation modelling has been used extensively and, where appropriate, subjective evaluations have been made by acknowledged experts. The findings of a wide range of disciplines (e.g. engineering, hydrology, geology and conservation biology) have been synthesised to present a comprehensive and comprehensible environmental impact report consistent with the Integrated Environmental Management Procedure."

C S I R

TECHNOLOGY FOR
DECISION-MAKING

PIPELINE INSPECTION
AND REBURISHMENT

South Africa has many thousands of kilometers of buried pipelines which represent a massive infrastructural investment. Defects in the coatings of buried pipelines are a major contributor to early failure and associated high costs of repair and downtime. The CSIR, in association with an international partner, has brought to South Africa a novel technique which permits detection of defects in buried pipelines to an accuracy of 15 cm with prioritisation and quantification of defects for refurbishment campaigns. Existing techniques cannot achieve the resolution of the direct current voltage gradient (DCVG) technique nor match its unique quantification capability. The use of this novel technique permits reduction of excavation costs when refurbishment is required and longer term planning of refurbishment strategies. The CSIR has also become involved in refurbishment projects where quality control is essential for success. A new initiative has been started in KwaZulu/Natal to extend our pipeline services to cathodic protection of pipelines in association with the Durban Corporation, supported through the CSIR's Durban office.

Pipeline inspection technology is used to locate defects in the external coating of a buried pipeline with high levels of accuracy and reliability.



HOUSING

INFORMATION SYSTEM

The Housing Information System was initiated as a joint venture between the Development Bank of Southern Africa and the CSIR with the full involvement of key players and users in housing and associated interest groups – including the National Housing Forum and the Department of National Housing. The objective of the Housing Information System is to provide readily accessible and cost-effective information to support the development and monitoring of appropriate housing policies at national and regional level to satisfy the planning and development requirements of South Africa. This information system will facilitate the allocation of scarce resources on a more rational and integrated basis, both in the provision of information services and in the preparation of sound sectoral policies.

PLANTATION DECISION SUPPORT SYSTEM (PDSS)

The Plantation Decision Support System (PDSS) is an integrated, spatially based plantation management information system designed to meet the operational and tactical needs of the commercial forestry sector. Individual modules in the PDSS, such as site classification and evaluation, weed management, forest damage control, fire protection, nutrition management and harvest scheduling are linked via an integrating platform to a centralised relational



The Plantation Decision Support System is designed to meet the operational and tactical needs of the commercial forestry sector.

C S I R

TECHNOLOGY FOR DECISION-MAKING

data base and modelling shell. The PDSS works in tandem with an external but compatible GIS. The functions of the PDSS include spatial and attribute data base querying, scheduling, heuristic prescription generation, data analysis including modelling, charting and mapping, data base editing and system customising.

GEOTECHNICAL INFORMATION SYSTEM

The CSIR is expanding its comprehensive Geotechnical Information System (GEOIS) for the central PWV area. The system is based on the land facet and land system approach to terrain evaluation. Two thirds of the area has been completed to date, with the remainder due for completion by September 1994. The CSIR has created data bases of soil

profiles and soil test information which are linked spatially via mapped terrain units in a GIS. It is aimed at all parties involved in the building industry, from development suitability mapping for planners and developers, to engineering, geological and geotechnical consultants requiring more specific information in the planning and execution of their projects. This information system is but one component of an urban data base being developed by the

CSIR to monitor and address the housing needs of a rapidly urbanising South African population. This will be of importance to the implementation of the Reconstruction and Development Programme.

ECONOMIC MODEL

FOCUSES ON PROFITABILITY

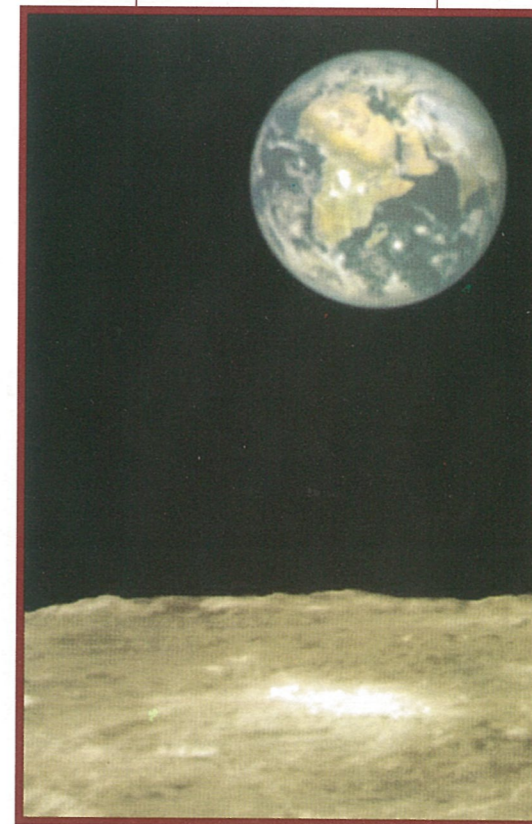
An economic model was specifically developed for mines by the CSIR (initiated by the Chamber of Mines Research Organisation, now part of the CSIR) to evaluate the potential profitability of different mining systems and thus identify areas from which maximum returns can be gained from changes in technology and methods of mining. A particular feature of the model is that it facilitates the redistribution of costs and statistics from the responsibility costing approach, generally adopted by mines, to activity-based costing. By redistributing overheads to actual mining activities, this approach allows the full impact of changes in technology to be assessed.

SUPPORTING THE FIRST NASA MOON- SHOT IN 25 YEARS

The Clementine Deep Space Programme Science Experiment (DSPSE), a joint effort between the US Department of Defence, the Naval Research Laboratories and NASA, provided the first opportunity in 25 years for the CSIR's Satellite Applications Centre to be involved in a NASA lunar mission. The Centre was approached through the French National Space Agency in mid-December 1993 to make arrangements for supporting the launch, scheduled for 25 January 1994. Specialised ground support systems were air-freighted to

C S I R

TECHNOLOGY FOR DECISION-MAKING



The CSIR's Satellite Applications Centre provided support for the January 1994 NASA lunar mission. (Photo: Naval Research Laboratories).

South Africa and integrated with existing tracking and communications systems in record time. Tests started in mid-January, and by 25 January the Centre was ready to support the launch, which eventually took place on the 26th. During the following eight days the Centre successfully supported all its scheduled assignments, including the monitoring of the critical Lunar transfer orbit burn.

SYNTHETIC APERTURE RADAR IMAGERY OF SOUTHERN AFRICA

A Memorandum of Understanding was concluded in December 1993 between the European Space Agency (ESA) and the CSIR allowing the Satellite Applications Centre to receive data directly from the ERS-1 radar spacecraft launched by ESA in July 1991. Synthetic Aperture Radar (SAR) is capable of penetrating cloud and rain during the day

and at night, and can provide sea state parameters over vast areas of ocean. It is also eminently suitable for a wide range of applications such as the assessment of soil moisture content, the detection and combating of oil spills and others in structural geology. Using an ERS-1 SAR receiver loaned to the Satellite Applications Centre by ESA, the first SAR transmissions from ERS-1 were received on 31 January 1994. The Centre will soon have its own ERS-1 receiver and processing system, enabling it to provide users with SAR data of southern Africa before the end of 1994.

**GOLDILUX RANGE OF
SPECIALISED METERS**

The Goldilux range of hand-held autoranging light meters and ultraviolet meters are accurate and robust instruments developed by the CSIR. The autoranging light meters are suitable for use as general-purpose instruments and have many laboratory applications. Optional attachments and accessories include a variety of remote probes. The instruments have been evaluated and endorsed by lighting engineers and consultants. The range of ultraviolet meters has been developed to measure UV-A, UV-B and UV-C levels and doses. They are available as dedicated units or with interchangeable plug-in probes. A number of local and overseas distributors for this product range have been appointed.

**PRE-ACQUISITION
ENVIRONMENTAL AUDITS
FOR INVESTORS**

Inheritance of environmental impacts with the purchase of an existing industrial site imposes legal and financial responsibility for amelioration and remedying on the new owner. Many companies have realised the value of pre-acquisition or property transfer environmental audits, the results of which can be crucial during negotiations on purchase agreements. The CSIR recently conducted a series of such environmental audits on nine South African sites for CPC International prior to finali-

C S I R

**TECHNOLOGY FOR
DECISION-MAKING**



A CSIR development: the Goldilux range of light meters and ultraviolet meters.

sation of the purchase contract. The complex and highly fragmented nature of South African environmental legislation posed a major challenge to the audit team. In their reaction to the final audit reports, CPC International emphasised the value derived from the interpretation of South African environmental legislation within the international legal framework by the CSIR.

**URBAN GROWTH
MANAGEMENT:
LAND FOR LOW-COST
HOUSING IN THE CAPE**

As part of the housing and urban growth management strategies for the Cape metropolitan area, the CSIR is assisting the Cape Provincial Administration with the identification of land for low-cost housing. A computer-

based system will be developed to classify and map potentially suitable land according to different criteria. Strategic data sets have been established and analysed using a geographic information system. Areas to be maintained for agricultural, environmental or other purposes are excluded and the remaining land has been classified into different categories of development suitability, with particular emphasis on average travel distances to possible places of work. The Western Cape Regional Services Council, Cape Metropolitan Transport, the Agricultural Research Council, Cape Town City Council, the University of Stellenbosch and the CSIR have col-

C S I R

**TECHNOLOGY FOR
DECISION-MAKING**

laborated on data-capturing and analysis. Software developed by the CSIR will be used to transform this data set into an interactive decision support system to explore the impacts of different criteria on land that may be selected for low-cost housing.

**AN INVENTORY OF
GREENHOUSE GASES**

South Africa recently became one of 155 signatories to the United Nations Framework Convention on Climate Change. The Convention aims to stabilise greenhouse gas concentrations in the atmosphere at a level below that which would cause unacceptable change in the global climate system. The first step in this process was for all signatories to prepare inventories of the gases they emit. These inventories are due for the next round of the Intergovernmental Panel on Climate Change (IPCC) Assessments in 1995. Future action will be based on these inventories. The CSIR has undertaken research on behalf of the Department of Environment Affairs to estimate the emission of greenhouse gases from South African territory. The methodology used for the South African inventory is currently being brought in line with the IPCC guidelines.

**CROSS-BORDER FREIGHT
FLOW DATA BASE**

Annual surveys conducted over the past five years at fourteen South African border posts provide the data for a comprehensive cross-border road freight data base developed by the CSIR. These surveys, conducted on behalf of the South African Depart-

ment of Transport, reflect trends in cross-border freight transport. Data include country of vehicle registration, origin and destination, commodity and tonnage. Data analysis shows a dramatic increase in road market share as opposed to rail, and a sharp increase in cross-border road tonnages. This valuable information will help the governments of South Africa, Zimbabwe, Swaziland, Botswana and Lesotho to develop a more equitable policy of cross-border vehicle permits.

**RISK ASSESSMENT FOR
THE FOOD INDUSTRY**

The CSIR's Food Quality Programme has implemented a food safety assessment and risk management system which incorporates statistical and mathematical models on specifically designed computer software. The system is used in conjunction with chemical toxicity data bases, decision trees and adapted modelling to form an integrated risk management strategy. It is linked to a well-established analytical service which is equipped to analyse food and feed samples in a wide range of areas, including analyses for pesticide residues, mycotoxins, toxic metals, food pathogens, nutritional value and food composition.



The food safety assessment and risk management system is linked to an analytical service for food and feed samples.

COMMERCIAL INTERNET

Commercial Internet, an Internet service provider, is a business venture between CSIR Information Services and Omnilink. It is a managed, cost-effective point of entry to the global Internet, the largest and fastest growing network in the world. Applications vary from simple electronic mail to file transfer (FTP), USENET, news, electronic forums on a great diversity of topics, and access to thousands of data bases and services around the world that were previously not commercially available. Whereas in the past Internet was only accessible to researchers and academics, Commercial Internet now allows private, corporate and LAN users to make use of the wide range of Internet services.

MINE ROPE SAFETY

The Mine Hoisting Technology Programme of the CSIR, acting as the main contractor and in close collaboration with the mining industry, Haggie Rand and the Government Mining Engineer, has proposed new regulations on mine rope safety which are based on a better understanding of rope strength, deterioration mechanisms, and dynamic loads. The new regulations are scheduled for implementation in 1994, and will increase viable depths of single lifts to 3 000 m and more, and also allow significantly higher payloads in existing shafts. In new shaft systems it may be possible to dispense with sub-vertical shafts, thus allowing quicker access to the reef. This represents enormous savings in capital costs and earlier returns on investment.

C S I R

TECHNOLOGY FOR DECISION-MAKING



The CSIR's expertise in mine hoisting technology has contributed towards proposed new regulations on mine rope safety.

26

KIEPERSOL

JOINT VENTURE

A joint venture, called Kiepersol, was recently entered into between the CSIR, the Department of National Health and Population Development and Eskom with a view to managing a National Network for the scientific monitoring of acid rain in South Africa. The marketing of this project is resulting in the financial involvement of a growing number of environmentally aware industries. Operationally, the Kiepersol Joint Venture is establishing an optimal integrated system to enhance existing information on rain water quality in South Africa. The ultimate aim of the project is to make available reliable scientific information on which to base a justifiable policy for the control of acid-forming emissions. The partnership between the joint venture and stakeholders from the private sector offers an exciting opportunity to put together significant resources in the best interests of the country and the environment.

EXPANSION OF TRANSPORTATION RESEARCH CAPABILITY IN THE REPUBLIC OF CHINA

The CSIR was commissioned by the Institute of Transportation (IOT) of the Ministry of Transport and Communication of the Republic of China to assist in developing a strategy and action plan for establishing a Transportation Engineering Research Centre to augment its current research and development capabilities. In collaboration with IOT counterparts and other stakeholders such as national and provincial road authorities, univer-

sities and private sector consultants and contractors, the CSIR team undertook a review of past planning, an industry needs analysis and strategic alternatives. Specialist staff of the CSIR and the IOT defined resource allocation and research direction in selected focus areas. The CSIR report contains an implementation plan with prioritised actions for the formal establishment of the Research Centre.

RAPID DATA ANALYSIS IN FACILITIES MANAGEMENT

The ability of the CSIR's PREMIS software to speedily analyse and graphically display results of queries related to facilities management has been significantly enhanced. This was clearly demonstrated in a recent installation of the system in England. Using tools that were developed last year, namely MISION (a high-speed graphical data base) and SYMBOLIX (a compiler language that enables PREMIS to control a relational data base and a graphical environment to produce symbolical reproduction of data), it was possible to analyse a data set in under two minutes compared with a competitive product's time of six hours. The time test was carried out using identical data and hardware.

JOINT EXPERT SPECIATION SYSTEM

The CSIR has developed a computer software package called JESS which allows chemical modelling to be done on complex aqueous systems. Such systems range from laboratory and industrial aqueous solutions to natural waters. The information provided by modelling is used to ensure a sound theoretical basis for deci-

C S I R

TECHNOLOGY FOR DECISION-MAKING

sion-making. Typical applications include industrial process optimisation and predicting the fate of heavy metals in the environment. JESS has an extensive, critically assessed thermodynamic data base with data for more than 37 000 chemical reactions. Both chemical equilibrium and kinetic modelling are possible. JESS modelling is available as a service to decision-makers at all levels.

RAPID DETECTION OF PATHOGENS IN WATER

The CSIR has developed rapid, sensitive methods for the detection of waterborne pathogens. The presence of pathogens in polluted water may give rise to epidemics of waterborne diseases. These methods have shortened the analysis time for certain bacterial pathogens (*Salmonella* spp.) from 5 - 7 days down to 10 - 12 hours. The technology can be used effectively to identify the agents causing the epidemic, and to prevent the spread of disease. Based on sophisticated genetic engineering techniques, the methods have been used successfully in a number of cases in which increases in the incidence of a specific disease have been reported by the affected community, e.g. in the recent typhoid fever outbreak in the Delmas/Botleng area.



The Kiepersol Joint Venture for the monitoring of acid rain in South Africa: drops of acid rain probably caused the stains on this flower. (See article on page 26).

27

- Portable micronmeter used by farmers to do real-time measurements of wool
- On-board truck scale to measure loads and their distribution on a truck
- Annual survey of housing and services information for planning purposes
- Molluscicide, a chemical product for controlling snails which transmit bilharzia
- Air pollution plume determination for mapping the movement of air pollution over a landscape with the aim of minimising stack emissions on surrounding areas
- ERUDITE, a new CSIR library management system
- Strategic review of the health and safety risks in the mining industry, with particular reference to research and development opportunities and requirements
- Development of a low skills base chemical processing pilot plant
- "Alice," a rural telecommunications system using code division multiple access (CDMA) technology
- High-speed camera (1 million frames per second) for detonation analysis, especially valuable in mining applications
- Static dust monitor to measure the dust generated on underground haul roads
- Annual survey to evaluate the cost of different housing delivery systems
- Training course in sorghum malting to demonstrate chemical and biochemical processes during malting
- Feasibility study for the development of a community information service in Mamelodi
- Casting of large single crystals with high creep resistance and high operational temperature capability for use in aircraft engines
- Processing of remotely

C S I R
**SOME OTHER
PROJECTS**

sensed data from satellites for industrial processes enhanced through manufacturing simulation and modelling, e.g. the daily delivery of sea surface temperature maps to the navy

- The simulation of industrial manufacturing and modelling processes
- Coupon-operated water dispenser to enable communities and local authorities to manage their water supply more effectively through an appropriate cost recovery system
- Development of a new technology for the carbonising of vegetable contaminants in wool and mohair
- Collision bureaux to improve the quality of collision reporting in developing communities
- Malt quality meter which simply and quickly provides a value for the diastatic power of sorghum malt
- Quantarc X, version 2 of Quantarc with Windows and expanded functionality, an information system for the building industry
- Development of radio-wave tomography equipment and system to provide an enhanced geophysical service to the mining industry
- Conductive and ultrasonic gels for medical and physiotherapeutic use
- Decision support for risk assessment of EIAs (environmental impact assessments)
- Development of polypro-

pylene double-faced fabrics for sports and leisure wear

- High-speed profilometer for optical scanning of road surfaces
- Septic tank effluent drainage systems, an alternative water-borne sanitation method with lower maintenance costs
- DNA fingerprinting for identifying materials at a genetic level
- Logistics modelling capability to ensure the most cost-effective supply of products from point of supply to demand
- Development of a special electrically conductive ink with good print properties to read electronically
- Geophysical data processing for the removal of time variations in the earth's magnetic field from field recordings
- Inspection measurement video cameras for use in boreholes and pipes
- Rapid biological assessment of rivers to assess their biological health
- Development of technology to produce backfill bags utilising a helical sewing process
- Road pavement deterioration prediction
- Assessment of safety needs in developing areas to create specific safety packages for specific communities
- Development of technology for the rehabilitation of sewers
- The evaluation of product concepts for shelf-stable foods
- Flexible spray-on coating to serve as temporary support in mine service excavations and stopes
- A low-cost flexible image processing system (FIPS) for measuring minute objects, e.g. DNA strands
- Groundwater modelling for aquifer management
- Determination of wind loads for the design of conveyor structures

