Bulletin
of the Rutherford and Appleton Laboratories 21 Sept. 1981 No.16

OPEN DAY for New Facility

On show to potential users on Monday 14 September was the latest RAL research provision, the Fluidised Combustion Facility.

Built in collaboration with Professor Davidson and the Chemical Engineering Group at Cambridge University and initially geared towards their requirements, the facility is essentially a flexible experimental rig that will permit a wide range of research to be undertaken, covering combustion and gasification of coal and study of the physics of high pressure and high temperature fluidised systems.

The Coal Technology Sub-committee, recognising the potential value of this central facility wished to publicise its existence to interested academic research groups - the Open Day was the result.

Mr Martin Wilson (Head of ERSU), Professor Davidson (Cambridge), Professor Atkinson (Nottingham), and Mr Ron Hopes (Project Leader) examining a sample of combuster feedstock. 36750

More Possibilities

Fifty eight visitors from universities and industry attended the event, and Mr Martin Wilson, the newly appointed head of the Energy Support Research Unit and SERC Energy Projects Coordinator, expressed his satisfaction at the amount of interest shown in the facility. Discussions identified several areas for future research. Gas clean-up processes and erosion-corrosion material research were just two of the fields explored and it is likely that more proposals will be submitted in the future.

How it Works

When a gas is forced to flow upwards through a bed of particles an upward drag force is exerted on the particles. A gas velocity can be selected such that this drag force is sufficient to support the weight of the particles. A further increase causes the bed to become turbulent and rapid mixing of the particles occurs. The surface is no longer well defined but appears diffuse with gas bubbles breaking through. A bed in this state is said to be fluidised. In such a condition the bed adopts many characteristics of a liquid, finding its own level and possessing hydrostatic head. In fluidised combustion the bed consisting of inert mineral matters such as sand, ash and limestone is fluidised and heated. Fuel is injected and burned in the bed.

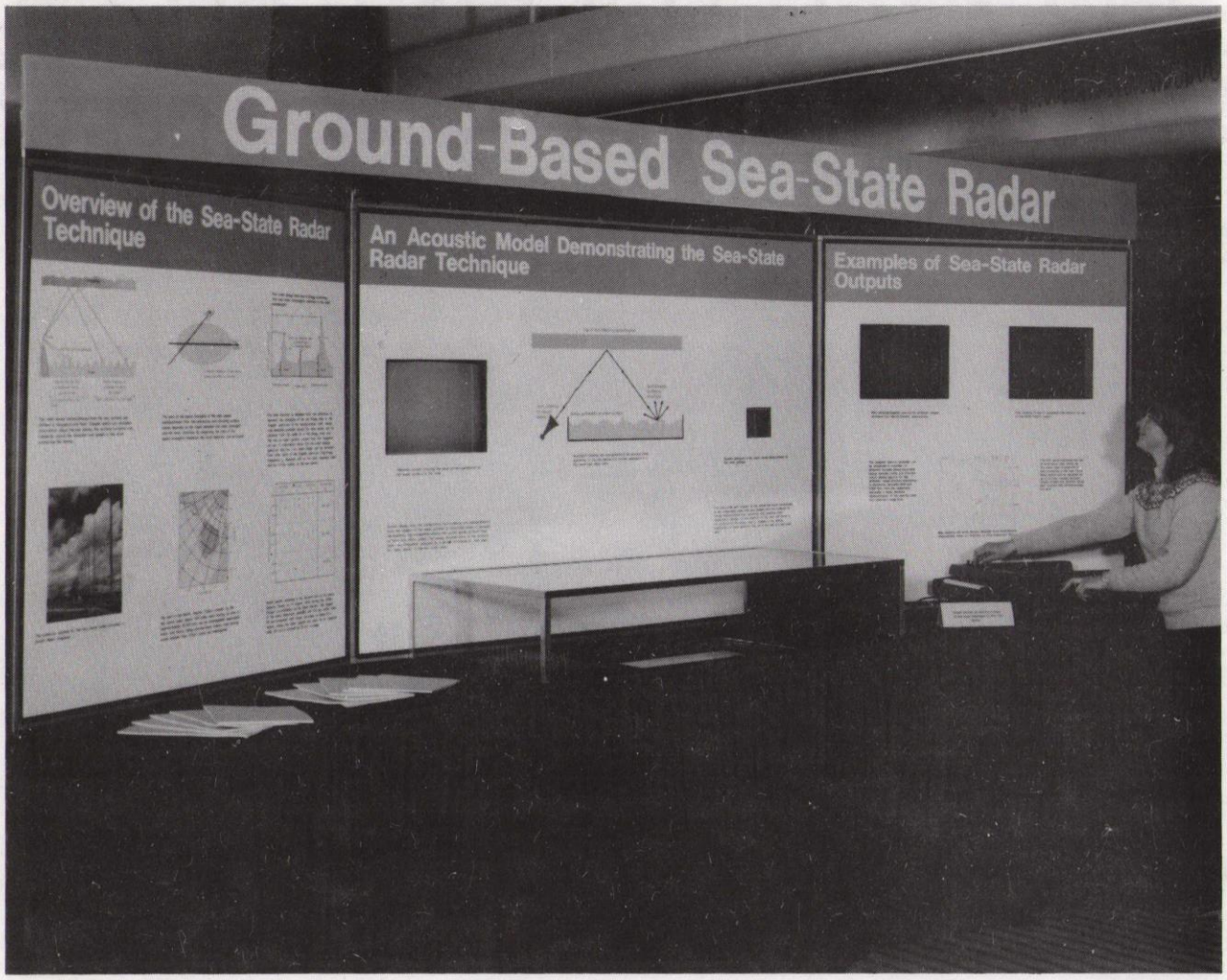
Revived Interest

The use of fluidised beds as catalytic reactors and dryers in the chemical and process industries is widespread, but recently, the so-called 'Energy Crisis' has led to renewed interest in coal processing and in particular when performed in fluidised systems. Unlike conventional pulverised fuel combustors, fluidised beds can handle a variety of feed stocks and many previously unattractive low grade or high sulphur fuels can be combusted in them. Gaseous pollutants arising from combustion may be reduced by adding limestone to the bed which then retains the sulphur. Nitrogen Oxide production is lessened at the lower temperatures at which fluidised combustors operate. Furthermore, if the combustor is operated at pressure and is incorporated in a gas turbine cycle the overall efficiency of the power generating process may be improved. Alternatively, the coal may be gasified (ie converted to a gaseous fuel). The composition and calorific value of the product gas are determined by the process operating conditions (ie temperature and pressure) and by the choice of gasifying medium (commonly air, oxygen or steam). This product gas has various uses; for power generation, as a substitute for natural gas, or as a feedstock for conversion to light fuel hydrocarbons.

An important aspect of this facility is the flexibility incorporated in the design enabling the unit to operate over a range of $20^{o}C$ - $1000^{o}C$ at pressures of 1 to 20 atmospheres.

We thank Ron Hopes for this encouraging news from the new facility.

Royal Society Exhibit at RAL



FC5254/2

Each year the Royal Society organises two prestigious evening Conversaziones at which a few groups in the United Kingdom currently working on new and exciting topics are invited to exhibit their work. These Conversaziones are not only attended by Fellows of the Royal Society and other leading scientists, but also by important national figures including, frequently, members of the Royal Family and the Government.

This year RAL was invited to provide an exhibit on the sea-state project. This exhibit is currently on view in the Foyer of RI where it will remain until October 2.

Sea-State Radar

The sea-state project involves the development, by RAL, Birmingham University and British industry jointly, of ground-based radars for studying winds and waves around the coast and in the North Atlantic region. The technique makes use of the fact that when radio waves strike the sea, they are Doppler-shifted and scattered in different directions by the waves on the surface. Observation of the Doppler spectra of the radio energy scattered back to the land-based radar, provides a very powerful technique for studying some of the features of the sea waves and for obtaining information about the winds which produce them. In particular, the spectra provide information about the wind speed and direction, the ocean surface currents, the sea wave-heights and the wave-energy directional spectra. One advantage of the radar technique for studying the sea surface, over that of 'in situ' measurements, is that it can be used to make observations at a great distance from the radar installation, and also that large areas of sea can be examined on a continuous basis.

Two Systems

Using medium-frequency radio waves in the ground-wave mode of propagation (that is, propagation along the surface of the sea), useful echoes can be obtained at ranges up to about 200km from a coastal radar. Much more extensive ocean coverage, up to distances of several thousand kilometres, can be achieved with high frequencies (3-30MHz); this is done by using the sky-wave mode of propagation which relies on ionospheric reflection of the radio waves on the outward and return paths. In the sea-state project both ground-wave and sky-wave systems are being developed and potential applications of them are being investigated.

Preliminary experience with the technique has indicated that the wind directions can be measured to within 15^{o}, while wind speeds and some oceanographic parameters can be measured with an accuracy of about 15%. The ground-wave radars being designed should be able to measure surface currents down to about 5cm sec^{-1}. The areas of the individual cells investigated depend, of course, on the design of the radar. In the case of the UK sky-wave radar, used for distant ocean regions, a cell size of 75km x 75km has been adopted, while the

projected ground-wave radar for off-shore investigations will investigate cells containing only a few square km.

Relevant in Many Fields

The information obtainable using sea-state radars is relevant to a wide range of disciplines beside oceanography and meteorology. Marine and coastal engineering, erosion control, design of off-shore structures and North Sea oil operations, all make use of accurate wave and current data. Surface current surveys around estuaries, sewage outlets and oil installations are of use in pollution monitoring, as are studies of downward currents that disperse the pollutants. Information gathered by these techniques would also be of great value to the shipping and fishing industries and in the energy field, to wave and wind power projects.

We are indebted to Dr J King for this interesting introduction to the sea-state project.

External Events

NPD COLLOQUIA - 1530hrs
H8 HARWELL

21 Sept: (1513hrs) Dr S Raman/Oak Ridge 'Radiative Neutron Capture and Heavy-Ion Induced X-ray Emission.

24 Sept: Mr E J Axton/NPL 'Nuclear Physics in China'

1 Oct: Dr S Brenner/Cambridge 'Genetic Engineering'

Doctors within the Science and Engineering Research Council do their best to make their opinions heard - maybe GP's know something!

Library Notice

The Library is *giving away* old and superseded books. RAL staff only may join the rush to the Reading Room R61 on Thursday 24 September at 9am.

Trade Exhibition

There will be a one-day exhibition by Spectron Ltd of their new range of endoscopes on Tuesday 29 September in Conference Room in Building R12 from 1000 to 1600hrs.

Missing

Lost on site at the weekend 13-14 Sept, somewhere in the area of R1, IRAS Control and the Library - a wristwatch rim! The rim is very unusual, being blue and red with 24-hour markings. Please contact David Ewart on Ext 6440 if you have found this item.

Would the person who 'borrowed' the Transparency Maker from Scientific Admin please return it.
Thank you.

Film Badge Notice

It is PERIOD 10 colour strip PINK. Please check that you are wearing the correct film badge and that all old ones are returned.

Next Film Change

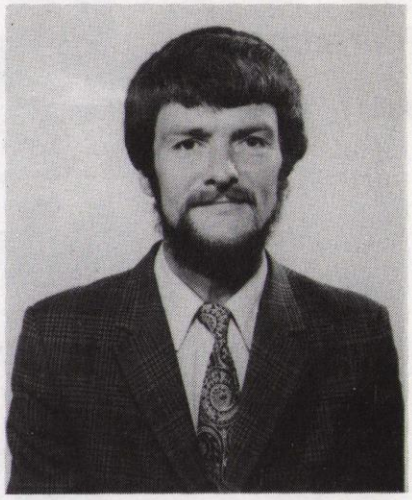
Monday 5 October.

Sales to Employees

The sale of scrap metal and plastics as set out in RLN 12/73 will be made on October 9 and 23, also 6 and 20 November.

Sales now take place at the rear of R24 Store from 1200-1230hrs.

New Head for ERSU



36630

On 1 August, Mr M N Wilson was appointed as head of the Energy Research Support Unit (ERSU) and the SERC Energy Projects Coordinator.

Although Martin Wilson comes to the energy field from a career which has so far been predominantly in the area of applied superconductivity, he has nevertheless worked in several areas of energy research and has a long standing interest in many aspects of the subject. In 1960, after graduating from Manchester University with a first in physics, he joined the nuclear power industry to work on reactor physics problems associated with the prototype AGR at UKAEA Windscale. In 1963 he joined the Rutherford Laboratory to work on high energy particle beams and on the production of very high magnetic fields by means of capacitor discharge techniques. This lead naturally to an interest in applied superconductivity and to a key role in the team which developed the filamentary composite superconductors, now being used in a variety of applications worldwide. The original motivation for developing this technology at RAL came from high energy physics research, but the Applied Superconductivity Group has subsequently worked on many other applications, some of them in the energy field, for example magnetic fusion technology and superconducting ac generators. In 1977 Mr Wilson spent a year as a visiting scientist at the Massachussetts Institute of Technology, working on the magnetic technology problems of Tokamaks and MHD power generation.

While retaining responsibility for the Applied Superconductivity Group in future, he expects to spend the great majority of his time on energy matters.

Rounders Tournament 1981

The Instrumentalists.

36758

To many readers, the mention of rounders conjures up memories of a game that was played at school by the girls whilst the boys played cricket. If these memories leave the impression that rounders is a 'sissy' game, then you should think again; many players have found that actually hitting the ball is more diffiult than it looks.

Harwell Rounders is played with 10 players in each team, no more than 6 of whom may be men. Each team has 2 innings of 10 minutes each, which makes the game fit into a lunch hour. Otherwise the rules are similar to the school game. Every attempt is made to keep the games to a friendly, sociable level, but each year there is criticism that some players are taking it too seriously and bringing too much physique into their play. In this form, the game has been played on site for 10 years or more, usually in the form of an organised tournament.

Having felt the loss of an organised tournament in 1980, this year some members of Instrumentation Division have arranged an American style tournament for 17 teams from Harwell and RAL. This tournament has been played during the lunch period throughout the summer months, and by the time you read this, will be complete. At the time of writing, the 17 teams have been reduced to just 4, and the winner will be decided on a knock-out basis.

The final, which will be played on Thursday 17 September, is certain to feature an RAL side, since the second semi-final will feature the IRAS Allsouls v the Instrumentalists. The IRAS side are being tipped as the likely victors, but their opponents are very much a big occasion side, and the outcome is by no means certain.

The earlier part of the tournament, in addition to the two RAL sides already mentioned, featured teams from SNS and R20 who, although giving a good account of themselves, unfortunately failed to qualify for the knock-out section of the tournament.

Slimming Club

Are you thinking of losing a few pounds after the excess of your holiday - or are you just determined to get into shape, at last? Why not join others with similar problems at the RAL Slimming Club.

We meet every Wednesday lunchtime between 1230 and 100pm in the East Wing Conference Room of R1. We shall be starting again on 7 October. New members are always welcome.

Further details from Gill Waters, Ext 6331.

Model Railway Club

The Annual General Meeting of the RAL Model Railway Club will take place on Thursday 8 October in R61 Conference Room from 1230-130pm.

All are welcome to the meeting, and prospective new members, doubly so.

Bulletin

Editor: Jean Banford
Building R20
Rutherford and Appleton Laboratories
Chilton, Didcot, Oxon OX11 0QX
Abingdon (0235) 21900 ext 484

Deadline for insertions: *Mon.28 Sept.*