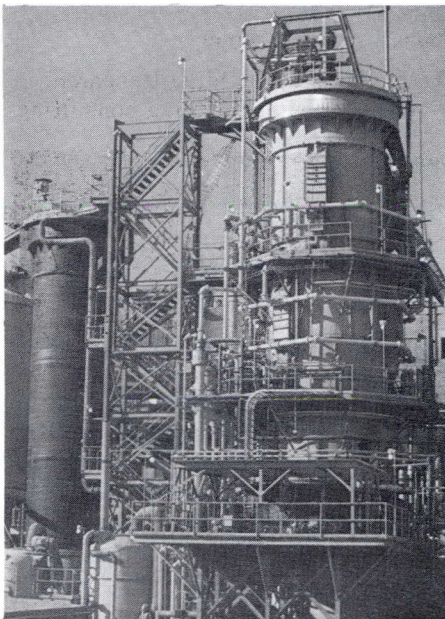


engineers, has sponsored and participated in the instrumentation of a unique tunnel which utilizes a "flexible" precast concrete tunnel lining. This is the first time the technique has been used in North America and represents a significant improvement in tunnelling technology. The tunnel-boring machine, designed and built in Canada and specially modified to handle the precast lining, becomes, underground, a protective shell within which the lining is erected and provides a safer environment for workers installing instrumentation.

New bleaching process

The bleaching tower of Eastex Corporation's Texas wood pulp plant in Selsbee, Texas, U.S.A. (*below*), is the first of its kind to employ a novel bleaching process developed by a University of Toronto scientist. His research is aimed at improving the production and bleaching of wood pulp for industry. Several important innovations have already arisen from the work which promises improved productivity and significant reduction in pollution. At Thunder Bay, Ontario, the world's first closed cycle kraft pulp mill is being constructed by the Great Lakes Pulp and Paper Company, based on these innovations.



Eastex's bleaching tower, Texas.

Long-life mini battery

The manufacture of a tiny battery used to power hearing aids, initially developed by the Defence Research Estab-

lishment in Ottawa, has been licensed by Canadian Patents and Development Limited to Unican Electrochemical Products Limited. It is expected that this long-life battery will be marketed at a low price. Unican, a subsidiary of Unican Security Systems Limited of Montreal, is raising capital to build a plant for the manufacture of the zinc-air battery which employs atmospheric oxygen as one of the components in the energy reaction. As a consequence, the battery can be produced in a reduced size.

Fuel injector transducer

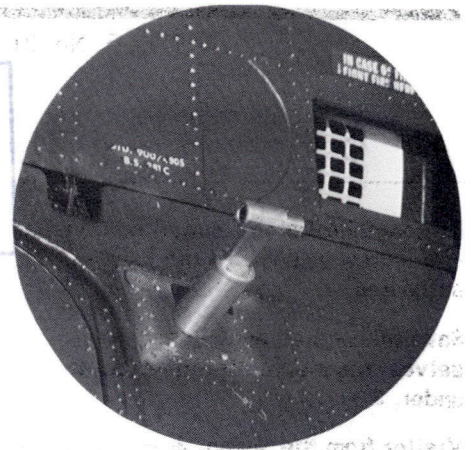
An NRC invention, licensed by Canadian Patents and Development Limited to Goodwood Data Systems Limited of Carleton Place, Ontario, will introduce savings in the maintenance of diesel engines. A transducer for measuring strain is clamped onto the fuel line which supplies each cylinder of the engine. Readings from the gauge can be used to determine the condition of the fuel injector valve, a crucial component of the diesel engine which is at present replaced periodically. Use of the transducer will cut down servicing times associated with large diesel engines in generating stations and ships. The company is at present supplying test batches of the transducer to several diesel manufacturers.

Anti-counterfeiting techniques

In its search for anti-counterfeiting techniques, the Bank of Canada is keenly interested in a development at NRC's Division of Physics that involves the design and production of complex iridescent films for security purposes. Such films change colour or reveal embedded patterns as they are viewed from different angles and in this they differ from dyes, inks or paints used in printing. This method has considerable advantages over existing devices in being much more difficult to counterfeit and in that its authenticity will be easily recognizable by the public.

Icing detector

A collaborative venture involving NRC, Leigh Instruments Limited of Carleton Place, Ontario, and Digital Electronics Laboratories Limited of Ottawa, has led to the development of an improved icing detector (*above*) for use in heli-



Icing detector

copters. The detector, which is being licensed by Canadian Patents and Development Limited, possesses notable advantages over conventional instruments. Helicopters, for example, are able to hover so that the air speed across their fuselage is almost zero while the rotors turn at high speed. Under such circumstances, a conventional detector may not give warning until the rotor blades are severely iced. The new system gives warnings under all conditions. Six of the instruments are being sold to the Royal Aircraft Establishment, England.

Icebreaker air-cushion vehicles

Following the discovery by Transport Canada and Canadian Coast Guard engineers that air-cushion vehicles are very effective in breaking thick ice on lakes and rivers, scientists from the Engine Laboratory of NRC's Division of Mechanical Engineering have cooperated with other government departments in this exciting new field and started tests to help clarify the yet unclear mechanism by which air-cushion vehicles break ice faster and with far less expenditures of fuel than conventional icebreakers. The research program in 1977 includes icebreaking tests on a pond at Ottawa's Uplands Airport air-cushion-vehicle test site, and drag tests on snow covered surfaces at Rockcliffe Airport, Ottawa. This development promises to be of great practical importance in helping many Canadian cities cope with spring floodings due to ice accumulation on rivers. The NRC Associate Committee on Air-Cushion Technology is considering an extended research project to define the requirements of air-cushion vehicles designed for urban flood prevention.