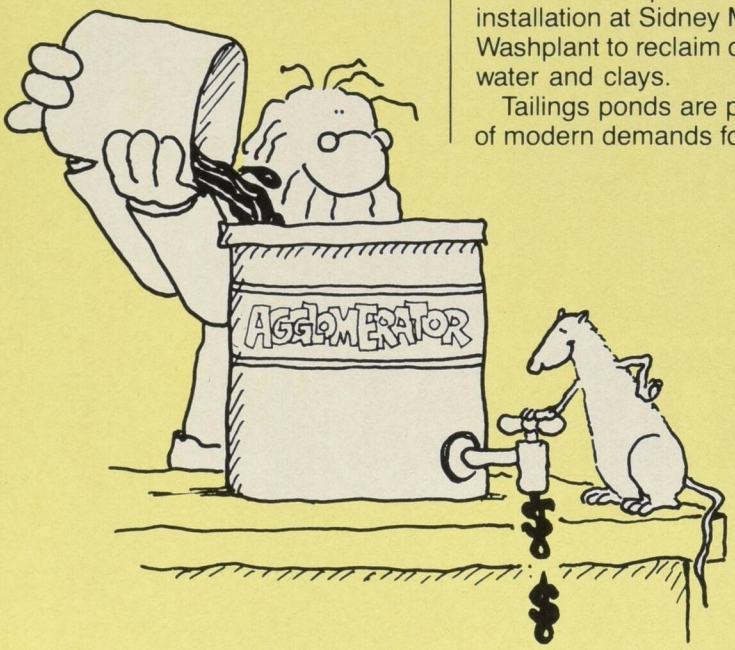
Cleaner Coal

Next to the ever-fickle market for their product, modern coal mines face few headaches equal to what to do with tailings ponds. These oozing black moonscapes are costly, unsightly, and dangerous — yet are currently unavoidable in North American coal mining. But to Dr. Ed Capes, head of NRC's Chemical Engineering Section, tailings ponds are not so much expensive environmental headaches as multi-million-tonne seams of valuable, low-ash coal.



After more than 10 years of lab research and pilot projects, techniques pioneered at NRC will be put to work at a tailings pond in Sidney, Nova Scotia. Under a licence from NRC, Guildcraft Ltd. of Markham, Ontario will operate a commercial installation at Sidney Mines' Princess Washplant to reclaim coal from waste water and clays.

Tailings ponds are partly the result of modern demands for cleaner coal. Much coal emerging from the mineshaft is of poor quality, and must be upgraded — especially to reduce air pollution when it's burned. But during this upgrading process, up to 20 per cent of the usable coal is ground into "fines" — particles too small to be handled.

The fines leave the upgrading plant not as a salable product, but as part of a watery "slurry" that must then pumped into ponds. Here, water and other liquids evaporate, while solids — coal and impurities — settle out.

The NRC 'oil agglomeration process' separates 95 per cent of the coal fines from the slurry before it leaves for the tailings pond. Small amounts of oil are introduced into the slurry, and high-speed agitation beats the oil into droplets. Then, through capillary forces, these droplets "wet" and draw together the coal fines. The principle is akin to what makes a cold glass stick to a smooth tabletop on a summer day.

Non-coal solids, which have surface properties different from coal, cannot be wet by oil and remain suspended in the water. A screen then filters out the coal-oil agglomerates, while allowing the impurities in the slurry to pass through.

The process has several advantages. Its major cost is the oil; but when the reclaimed fines are used as fuel, all the heat value of the oil is retained. The oil need not even be high-quality. Furnace oil, bunker oil, and even recycled waste oils will all do.

Barry Estabrook is an Ottawa writer.

Cracks Of Doom

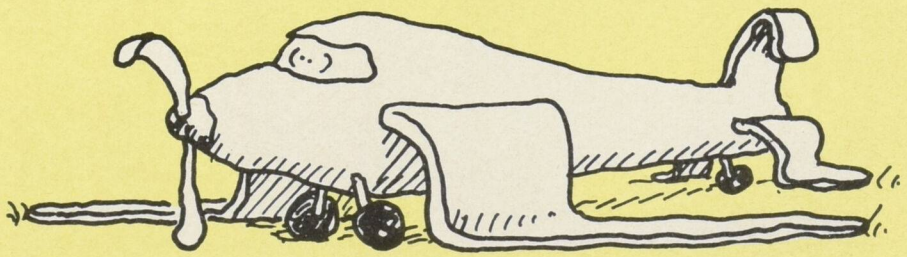
Metal fatigue is wholly or partly responsible for almost 100 plane accidents a year worldwide. At NRC's National Aeronautical Establishment (NAE), engineers are studying the problem and ways to avoid it.

According to Dave Simpson, head of the NAE group investigating metal fatigue, gusts of wind and aircraft manoeuvres put stress on metal parts. Although the parts are designed to withstand a maximum stress level without breaking up, over long periods stress levels lower than this amount can cause cracks in the metal, possibly leading to structural failure and an accident.

One of the ways the NAE engineering team combats metal fatigue is by conducting tests on full-sized aircraft. Their laboratory is large enough to house a Canadian Forces Tracker, submitting the airplane to a battery of computer-controlled fatigue tests. These simulate real-life stresses, and usually end by breaking up the plane. But at the same time, the tests derive enough information to set new safety standards for the industry and prolong the life of other aircraft. The Tracker tests, for example, mean the Tracker will last four times its original design life — 20 000 hours instead of 5 000.

Aeronautical engineers can also evaluate new testing methods in these full-scale tests. In the Tracker program, for example, they used the noise of cracking metal as an indicator of damage.

Anne McIlroy is a freelance writer in Ottawa.



Cartoons by John Bianchi