cent remains on the roads as a dust suppressant; some of the remainder finds its way into the fields and waterways which border dusty country roads, and eventually into our foods through livestock and crops. Studies have shown that dust transportation and run-off account for nearly 70 per cent of this waste oil, while 30 per cent is lost through evaporation, adhesion to vehicles and biodegradation. Moreover, vegetation in adjacent fields has been found to be high in metallic compounds.

Mr. Don J. Skinner, program engineer for Environment Canada's Petroleum and Industrial Organic Chemical Division, has worked closely with Mr. Strigner on this problem. He offers certain alternatives to waste oil for this application. Calcium chloride is an excellent, if somewhat expensive and corrosive, dust palliative. Oil refineries also produce a topping to be sprayed on dirt roads but this could contain complex hydrocarbons called polynuclear aromatics (PNA's), believed to cause cancer. Pulp and paper mills also produce a biodegradable black liquor waste, which is currently being burned. Laboratory tests indicate that this black liquor waste could effectively minimize those annoying dust clouds, making it an attractive alternative.

Alternatives must also be found to another method of waste oil disposal: indiscriminate burning, which can lead to serious pollution hazards. This burning releases into the air non-combustible compounds such as micron and sub-micron (easily inhalable) sized metallic oxides with high contents of lead, phosphorus and calcium, as well as PNA's.

Another means of disposing of waste oil is gaining acceptance: five to six million gallons (22.5 to 27 million liters) are refined yearly in Canada. The used oil usually undergoes a process of dehydration and predistillation. This involves heating the product to 525 – 550°F (275 – 288°C) in the case of diesel oil and 600 – 625°F (316 – 330°C) in the case of automotive oil. This distills off the water, gasoline and solvents and thermally degrades some of the additives. The oil is then treated with sulfuric acid, which removes resins, unsaturated hydrocarbons, some original additives and most metals, in the form of acid sludge; this sludge is used as landfill, a problematic solution from an environmental point of view, since the long-term effects of such disposal are unknown.

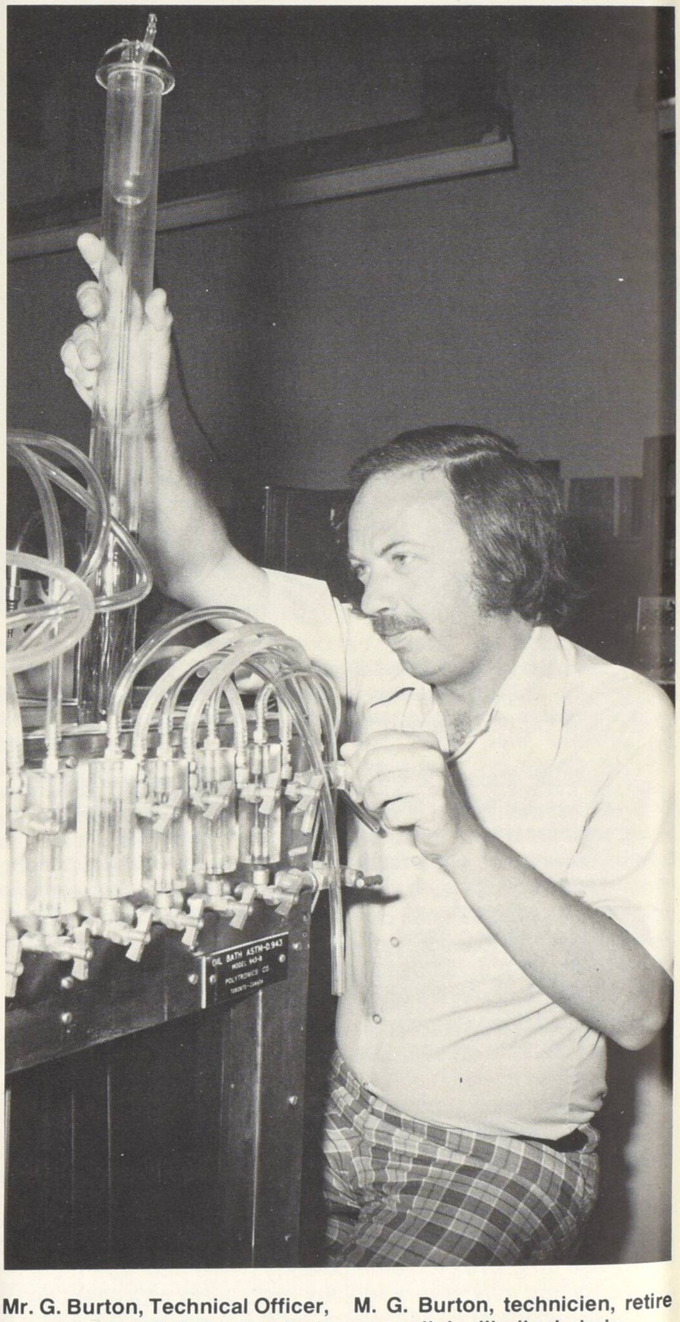
Following the acid treatment, the oil is treated with clay; four to five pounds (1.8 to 2.3 kg) of clay are used for every 100 pounds (45 kg) of used oil. The mixture is heated to 500 – 600°F (262 – 316°C) and stripped with superheated steam to remove unstable compounds and particulate matter. The process gives the oil its desired color and odor.

In 1974, one of the re-refiners, Turbo Refineries, Edmonton, received a grant under NRC's Industrial Research Assistance Program (IRAP) to seek an alternative process which avoids acid treatment. Laboratory work under the direction of Dr. D. Cameron of Turbo is centered principally on a vacuum distillation/hydro-treating process, although pretreatments and other post-treatments around the vacuum distillation are being tried. Work is now being undertaken on the pilot-plant scale level under an Industry, Trade and Commerce grant. Experimental oils recovered from the Turbo work are evaluated in the Fuels and Lubricants Laboratory especially for oxidation stability.

Each of these treating processes produces in turn treatment wastes which must be handled in a non-polluting manner. The sole exception seems to be the cement kiln. Environment Canada and the Ministry of Environment of Ontario, have co-sponsored a burn in a dry kiln, in cooperation with the Ontario Research Foundation and the St. Lawrence Cement Co., with interesting results. The kiln acts as a natural dry lime scrubber; the cement absorbs 95 per cent of the sulphur and up to 90 per cent of the lead and zinc. Moreover, such contaminants as metals, ash and impurities are trapped in a form which is non-hazardous and useful. Cement kilns are located in most population centers across Canada and could thus provide local disposal sites. This process is economically superior to other disposal methods studied to date in that it requires no adjustment to the kiln, may reduce natural fuel consumption by up to 35 per cent and involves no deterioration in the properties of the cement. It is interesting to note that the alkalinity of the end-product, and thus the possibility of swelling during construction, is actually decreased.

Natural resources have become finite and precious. The waste of these irreplacable resources in a manner that is further poisoning the environment has become an area of concern which this research can help to elucidate. ☐

Diane Bisson



Mr. G. Burton, Technical Officer, removes a cell from the bath section.

M. G. Burton, technicien, retire une cellule d'huile du bain.