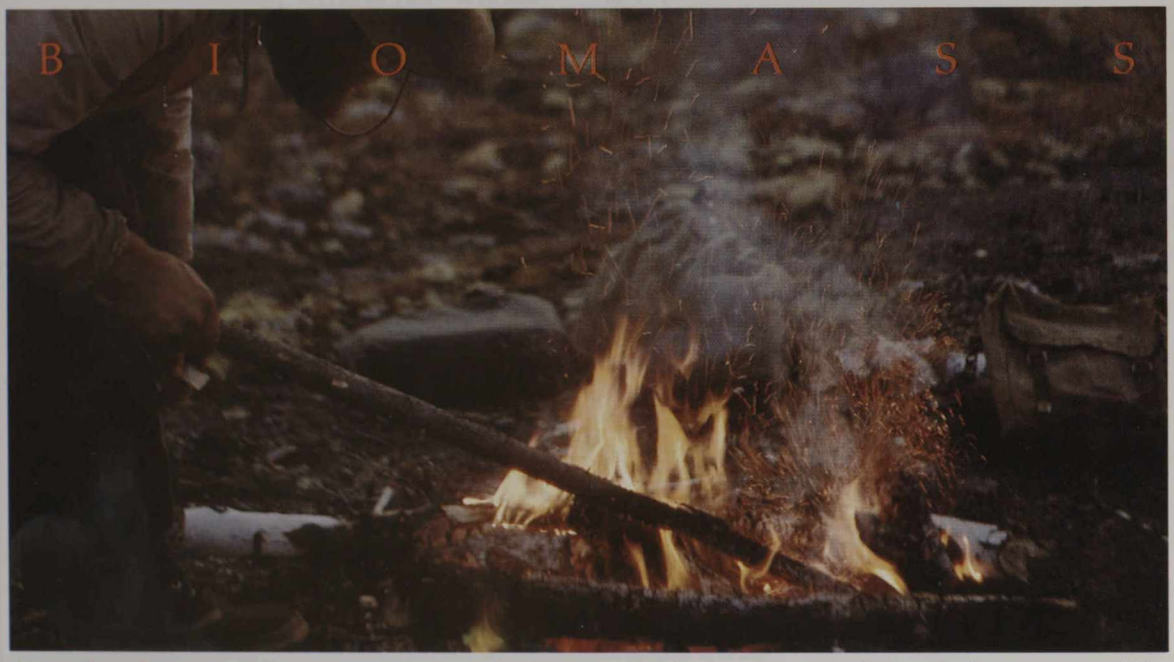
formed Great Canadian Oil Sands, Ltd. in 1967 and built a 50,000-barrel-a-day plant.

GCOS drains the muskeg swamp every two years, but in the summer the ground is softer than melted ice cream and almost impossible to work. In the winter 1,800-ton bucket-wheel excavators (each costing $6 million) scoop it up and dump it. Each bucket cuts out a chunk of spongy clay or tarry sand 21 by 37 metres (70 by 120 feet) and dumps it in special 150-ton trucks (each costing more than $300,000). The tar is then separated from the sand by dousing it with hot water, producing what has been called "contaminated asphalt." It is run through a coking and hydrodesulphurization process and becomes a synthetic crude oil, which is sent south to Edmonton where it joins the thick black river flowing through pipelines. GCOS is now producing 45,000 barrels of oil plus 300 tons of sulphur and 2,300 tons of coke a day, but the coke and sulphur are too far from markets to be salable, and they just pile up.

This fall Syncrude Canada (a consortium of Petro-Canada, Cities Service, Pan Canadian Petroleum and Gulf) began operating a $2.4-billion strip-mining complex, which has a capacity of 129,000 barrels a day. The strip-mining technique strikes most participants as cruder than the oil, and it cannot reach tar sands in places like Cold Lake where they are covered by 275 to 490 metres (900 to 1600 feet) of overburden. Imperial Oil has proposed a plant using processes (heating the bitumen in the ground by steam injections) that could produce 125,000 to 140,000 barrels a day at Cold Lake.

The profit prospects for tar-sand recovery are good. The GCOS plant initially lost a total of $90 million but has been in the black since 1976 and reduced its accumulated deficit to $40 million.



In its broadest sense, biomass includes all plant life and the wastes, residues and by-products of all living things. It can be converted to solid, liquid and gaseous fuel.

Dry biomass is biomass that is, more or less, ready to burn. It includes logs, twigs, dry straw and the stumps of chopped down trees. Wet biomass is biomass that is at least 50 per cent moisture—manure and municipal garbage for example—and it can be burned or made to produce methane gas.

Trees

The best present source of biomass fuel in Canada is its forests. A hundred years ago wood was North America's principal source of energy, and Canada's forest industry will supply most of its own energy needs by 1985.

Cariboo Pulp & Paper Ltd. in Quesnel, British Columbia, produces 80 per cent of its own mill power with waste wood.

British Columbia Forest Products Ltd. is investing $20 million in waste-burning boilers. One at Crofton on Vancouver Island uses the equivalent of 420,000 barrels of oil a year. A turbine