
MIGHTY MINING MACHINES

Mining oil sands is an enormous process, which requires extremely large machines. The original mining process has evolved and changed as new innovations in equipment and techniques allow the process to become more efficient and economical. In the early 1900's, when people began mining oil sand, the operation was completely manual. Technology has come a long way since then!

Many different types of machines are used to remove the overburden (the muskeg and layers of soil over top of the oil sands deposit) to prepare the area for surface mining. Bulldozers, backhoes, loaders, water trucks, scrapers, side booms and graders are all used to move the overburden, which is saved to use in reclamation.

When Suncor started in 1967, as Great Canadian Oil Sands, they mined oil sand with huge bucketwheel excavators (Also see **Cyrus** Fact Sheet). The bucketwheel excavator would dig directly into the open mine pit. The oil sand would be picked up by the buckets and deposited onto a conveyor belt system that would transport the oil sand from the mine into the extraction plant.

When Syncrude opened in 1978, they were using draglines (the largest walking machines on earth) and bucketwheel reclaimers. The dragline would deposit the oil sand into a pile called a windrow. The bucketwheel reclaimer would then scoop up the oil sand from the windrow and deposit the oil sand onto a conveyor belt system that would move the oil sand into the extraction plant. The use of draglines and bucketwheel reclaimers will be phased out by 2005/2006.

Today Suncor, Syncrude and Albian Sands are all using the same mining technology – truck and shovel. The move from draglines and bucketwheels to truck and shovel mining is mainly due to cost and efficiency. The shovels can move more easily to select the richest oil sand and ignore low-grade ore. Truck and shovel mining is more mobile, requires less maintenance and has much less effect on general production if there is an equipment break down.

Open pit mining is done in benches or steps. These benches are each approximately 12-15 metres high. Giant shovels dig the oil sand and place it into heavy hauler trucks that range in size from 240 ton to the largest trucks, which have a 400-ton capacity. The trucks dump the oil sand into sizers or crushers, which break up the big chunks of oil sand to prepare it for transport into the plant. The sizers are the largest of their kind ever manufactured.

The oil sands companies have had to adapt some of the equipment to meet the unique needs of the industry. For example, a crawler tractor used to build up walls of the tailing ponds has its radiator and cooling fan on top of the cab. This prevents oil particles, water and sludge from getting into the radiator, causing the engine to overheat.

The 150-ton truck on display at the Oil Sands Discovery Centre is a baby compared to the size of the newer heavy haulers.

MIGHTY MINING MACHINES, Continued:

Mining Fast Facts:

- The replacement cost of a Dragline is approximately \$110 million!
- The bucket size of the Dragline is 68 cubic metres (89 cubic yards), which is approximately the size of a two-car garage!
- The replacement cost of a Bucketwheel Reclaimer is \$35 million!
- Conveyor belts cost \$1,000 per foot to purchase and maintain!
- At the peak of conveyor belt use Syncrude had 30km and Suncor had 8 km of conveyor belt in their mines!
- The conveyor belt used at Albian Sands is one of the largest in width at 96 inches!

Heavy Hauler Trucks

- Caterpillar 777 (100 ton), Caterpillar 793 (240 ton), Komat'su 830E (240 ton), Komat'su 930E (320 or 340 ton), Caterpillar 797 (360 & 380 ton) and Caterpillar 797B (400 ton), and Liebherr (400 ton) haul trucks currently in use.

Caterpillar 797 truck empty weight: 557,820 kg (1,230,000 lbs.)

- Drive: 3524B EUI twin turbocharged and after cooled diesel engine
- Max Speed: 64 km/h or 40 mph
- Horse Power: 3500
- Suspension: self contained oil pneumatic suspension cylinder on each wheel
- Height empty: 7.1 metres (23ft 8in) Length: 14.3 metres (47ft 7in) Body Width: 9.0 metres (30ft)
- Dumping Height: 14.8 metres (49ft 3in)
- Tire Size: 3.8 metres (12.9ft) in diameter
- Cost: \$5 - 6 million

Caterpillar 797B empty weight: 623,690 kg (1,375,000 lbs)

- Drive: 3524B Series, 24cylinder, four-stroke cycle, diesel engine
- Max Speed: 67 km/h or 42 mph
- Horse Power: 3550
- Suspension: independent, self-contained, oil-pneumatic suspension cylinder on each wheel
- Height empty: 7.6 metres (24ft 11in) Length: 14.5 metres (47ft 5in) Body Width: 9.8 metres (32ft)
- Dumping Height: 15.3 metres (50ft 2in)
- Fuel capacity: 6,814 L or 1,800 US gallons
- Cost: \$5 – 6 million

Shovels

- O & K RH400 Hydraulic Shovel

- Powered by: 2 Cummins QSK60 Diesel Engines (2000 hp ea) or 2 Caterpillar 3516 Diesel Engines (2200hp ea)
- Fuel Capacity: 16 000 litres – allows 24 hr continuous operation without refueling
- Bucket Capacity: 80-90 tonnes
- Maximum Dig Height: 17.1 metres (57ft 1in)
- Hydraulics: 10 000 litres Hydraulic Fluid, 5000 PSI Operating Pressure, 8 main pumps move 8000 litres per minute, produces 2100kg or 471,930lbs of breakout-force
- Under-Carriage: World's largest final drive transmission, 1.8 km/h, 2000mm wide track shoes
- Cost: \$12 million

MIGHTY MINING MACHINES, Continued:

- P & H 4100TS Cable Shovel

- Working weight: 1,351,558 kg (2,977,000lbs)
- Suspended load capacity: 154,360 kg (340,000 lbs)
- Dipper capacity: 47.4 cubic metres -voltage: 15,000 volts
- Boom length: 21.34 m (69.4 feet)
- Travel speed: 0.84 km/h (0.52 mph)
- Crawl shoes: 3.54 metres (138 inches)
- Cost: \$17 million

-Bucyrus' 495HF Electric Rope Shovel

- Gross working weight: 1,315,000 kg (2,900,000 lbs)
- Overall height: 20.72 metres (68 feet)
- Overall width: 13.01 metres (42 feet 8 inches)
- Overall length: 28.85 metres (94 feet 8 inches)
- Single pass loading of 100 tons
 - Cost: \$15 million

-Tires

- One tire for a 400 ton 797 truck costs an estimated \$35,000 (Canadian).
- Dimensions: 4 meters high and they weigh over 15,000 kilograms.
- Life Span: 1 year to 15 months
- Reused For: cattle feeders, play ground features, and perimeters at look out areas at the sites.

Related Websites:

P & H Mining Equipment: www.phmining.com

Caterpillar: www.cat.com

Komatsu: www.komatsu.com

O & K - Orenstein and Koppel: www.orenstein-koppel.com

Bucyrus-Erie: www.bucyrus.com

LeTourneau Inc.: www.letourneau-inc.com

Finning: www.finning.com

Transwest Mining Systems: www.transwestmining.com