St Marys Cement – part of the community

St Marys Cement plant was founded in 1912. It is the largest employer in the Town of St. Marys, Ontario and one of Canada's leading cement manufacturers. As such, the company is very aware of its responsibilities. The safety and health of employees, neighbours, the local community and customers, as well as protection of the environment, are of primary importance. St Marys Cement is committed to complying with all environmental laws and regulations and is committed to continual improvement in the environmental performance of the operation.

Producing cement from limestone, clay and various other raw materials requires a huge investment in manpower, equipment and energy. Pollution control devices are part of the St Marys commitment to reduce atmospheric emissions. The baghouse for instance, is designed to remove particulates from exit gases. This strict control of emissions enables the St Marys plant to meet stringent air quality standards.

Safety Coordinator Chris Bullock instructs summer student Kelly Trot in the safe operation of a lift truck

St. Marys provided land and cement to assist the community in the creation of a first class baseball diamond.

ST MARYS

St Marys Cement

St. Marys, Ontario

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ST. MARYS PLANT
P.O. Box 1000, 585 Water St. S.
St. Marys, Ontario N4X 1B6
Telephone (519) 284-1020
www.stmaryscement.com

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The intelligent use of our natural resources

For its raw materials, cement uses minerals containing four essential elements: calcium, silicon, aluminum and iron. The St Marys Cement plant relies on a quarry located nearly a kilometre west of the plant for limestone, which is the calcium component and the primary ingredient of cement. This is coupled with smaller quantities of clay, mined from another location east of the plant, and sand. These are sources of silica, aluminum, and iron. Other raw materials, such as shale, bauxite and fly ash are trucked in as necessary. Generally, the extraction of the raw materials required to produce cement causes less damage to the environment than the production of comparable building materials and ultimately, quarries can be reclaimed for agricultural, recreational or commercial development.

RAW MATERIAL

After limestone is blasted from the face of the quarry, trucks haul the shot rock to the primary crusher. This raw feed is then transferred across the Thames River by conveyor to a stockpile where the secondary crusher further reduces the material in size. It is then conveyed to the 2,200 tonne storage silo at the plant. Clay is hauled to the plant by truck where it is dried before being stored in two additional storage silos.

Hardworking 40 tonne quarry trucks transfer shot rock from the face to the primary crusher within the quarry.

Loader operator, Larry Foreman stands beside his Cat 990 to demonstrate the scale of the equipment required to lift shot rock from the quarry floor.

An extensive conveyor system moves raw material from the primary crusher in the quarry to the stockpile near the plant.

A drilling rig is used to bore holes into the limestone. Explosives are then placed and the blast detonated from the other side of the quarry.

A chemical transformation

The 72 metre high preheater tower supports two bucket elevators which lift the meal to the top. To save valuable energy, hot exit gases from the kiln heat the raw meal in a series of vertical cyclone chambers through which the meal passes on the way to the kiln.

KILN

The 75 metre long kiln is a huge rotating furnace – a horizontally sloped steel cylinder, 4.75 metres in diameter, lined with firebrick and turning about two revolutions per minute. The raw meal enters the kiln at the upper end as a powder. It slides and tumbles down the kiln through progressively hotter zones. At the lower end of the kiln, fuel (powdered coal, coke or natural gas) feeds a flame that reaches 1870°C – one-third the temperature of the sun's surface. Here in the hottest part of the kiln, the raw materials reach about 1480°C and become partially molten. This intense heat triggers chemical and physical changes. A series of chemical reactions converts the calcium and silicon oxides into calcium silicates, cement's main component. At the lowest end of the kiln, the raw materials emerge as a new substance called clinker.

The 75m long kiln rotates twice a minute as the raw material rolls and slides along its length.

Using a mixture of coal and coke mixed with air for fuel, cement kiln temperatures reach 1870°C causing a chemical change in the raw material.

Coal and coke are stored in the yard until required as fuel.

The four stage preheater tower uses waste heat from the kiln to raise the temperature of the raw meal and reduces the energy required to produce the clinker.

Proportioning, blending and grinding

The limestone and clay must first be analyzed and blended in the proper proportion. Using the plant's roller mill, the material is ground even to the consistency of sand. The resulting raw meal and the recycled kiln gases used to dry it, pass through a bag house where particulates are removed before the gases are exhausted into the atmosphere. The material then drops into one of two homogenizing silos below, where it is blended before overflowing into the kiln feed silo.

THE AUTOMATED PROCESS

Skilled operators constantly monitor the operation of the plant from the control room. Temperatures, flow rates, pressures and the chemical composition of the raw meal are just some of the variables which may effect the quality of the final product. Although 145 people are required to operate the St. Marys plant, it is still fully automated and computer controlled. This room is the flight deck of one of the largest pieces of moving machinery in the world . . . a modern cement kiln.

Gary Smale watches the roughly two-to-one mixture of limestone and clay on its way from the raw mill.

A Cat 375 backhoe digs deep into a pile of silica, one of the raw materials required to chemically balance the manufacture of Portland cement.

Glen Watkinson is one of the kiln operators responsible for overseeing the computer controlled functions of the plant.

The roller mill uses recycled kiln gases for drying the limestone and clay during this stage of the grinding process.

Finely ground

After being cooled, the clinker is again crushed before being discharged onto a conveyor. To save energy, heat recovered from the cooling process is recirculated back to the kiln. The clinker, is transferred on the conveyor to the 45,000 tonne A-frame storage hall.

FINISH MILLING

The clinker is next ground in one of five ball mills – huge rotating, horizontal steel cylinders containing steel alloy balls in one or two chambers. The clinker, along with other materials added to impart special characteristics to the finished product, is ground into powder so fine it will pass through a sieve that could hold water. Up to 5% gypsum, to regulate the setting time of the cement plus other chemicals, such as those which regulate flowability or air entrainment, are added at this stage.

A state-of-the-art lab is used to analyze the raw material, maintain quality control and formulate special products. Lab Technician, Mike Stanzel begins fusing cement samples before x-ray analysis.

The A-frame storage building is used for the storage of clinker until it can be ground.

Ball mills (five all together) are essentially steel tubes which contain various sized steel balls. As the mills rotate, the clinker is crushed into a fine powder.

Clinker, still cooling on the conveyor, fresh from the kiln.

The St. Marys plant has 90,000 tonnes of cement storage while production capacity is more than seven times that amount.

Moving right along . . .

From the grinding mills, the finished Portland cement is conveyed to silos where it awaits bagging or bulk shipment. All of the bulk cement is moved by tanker truck or rail from the St Marys plant. A small percentage is bagged for specialized purposes such as masonry mortar. Flatbed trucks stacked with bags on skids and tanker trucks and rail cars containing cement in bulk are constantly leaving the plant.

Pallets of bagged product are loaded onto a Hutton Transport truck being tied down by driver Craig Paton.

Gate No. 1 at the St. Marys Plant

St Marys Cement is transported in bulk by truck and rail.

Masonry and mortar cements of various types are the common bagged product packaged at the St. Marys Plant.