Horizontal mills for the cement industry

Shift your perspective for maximum efficiency

Horizontal mills, almost exclusively ball mills, are widely used in the cement industry to grind materials into the required size. If the equipment is not operating at optimum efficiency, the result will be excessive energy and maintenance costs, reduced throughput and increased downtime. This can cause losses in both production goals and operating economics. In order to increase throughput and reduce costs, owners need engineering solutions that:

**Improve speed control**
Accurate speed control is essential to complete the grinding process and produce materials that are properly sized. Over time, the input materials characteristics may change as well. Ball mills in a cement plant require accurate speed control so that the grinding process may be adjusted to accommodate these variations. This, in turn, enables the mill to optimize its throughput.

**Lengthen maintenance intervals**
Like most other industries, cement plants often have difficulty finding workers whose skills match their requirements, particularly when the facility is located in a remote location. High labor costs also contribute to excessive operating costs. One solution to both those problems can be equipment that is easier to service or needs maintenance less often.

Achieving that goal requires equipment whose components are optimally sized and constructed to meet the range of operating conditions specific to the site. That produces less mechanical and thermal wear in operation and is specifically designed to enable longer maintenance intervals.

**Lower energy costs**
Horizontal mills consume large amounts of electricity. Since one of the largest operating cost burdens for cement plants is often electricity, the drive system controlling the mills must be extremely energy efficient if operators are to produce finished materials at the lowest possible cost per ton.

**Cement ball mill drive system options**
For ball mills in the cement industry, there are two fundamental choices that need to be made on the drive system. Will it be driven from a single drive system or dual, and will the selected drive system(s) be fixed or variable speed. Siemens, with its unique portfolio and expert engineers, supports either option.
Making things right

Siemens offers Integrated Drive Systems that address key challenges with ball mills
Siemens experience with ball mill drives is almost as old as the application itself. Siemens offers drive systems for ball mills with alternatives for variable speed solutions, as well as fixed speed options customized to the user’s application. Siemens ball mill drives deliver high energy efficiency and provide the highest reliability and availability in the market.

A ball mill, especially one loaded with product from a dead start, represents a very high starting torque application. For fixed speed applications it remains common to provide a wound rotor AC induction motor with a slip ring that provides additional torque by energizing the rotor only during initial startup. These motors are usually started using an additional variable resistive load inline with the rotor. This provides the ability to provide the starting torque required, and to then function as a fixed speed drive system once fully accelerated.

For variable speed applications, with the evolution of the AC variable speed drives, it has become quite common to supply AC “squirrel cage” induction motors; even in this high torque application. Siemens also has the expertise to provide DC drives if required. Whether fixed or variable speed; the customer always receives an optimized drive system which has been individually customized to their unique specifications.

For both fixed and variable speed applications, Siemens Integrated Drive Systems also has the ability to provide the most efficient gear solution possible. Ball mills use a girth gear, installed around the shell of the mill, to engage the drive system(s). The interface to the girth gear can be either a pinion gear, connected by a shaft and coupling to the (MDSS) gearbox, or a direct mesh gear (DMG2) integral pinion gearset within the housing of the gearbox itself. The DMG2 solution offers fewer components which provides greater reliability and higher efficiency.

Eliminating design overlap reduces system costs up to 50%
In horizontal mills, drive systems are often over-engineered when components are sourced from multiple vendors. This design overlap can achieve a dramatic high value, increasing the initial cost of the equipment, the equipment’s footprint, and long-term operating costs for users. Siemens expert engineers account for all safety factors when designing Integrated Drive Systems, assuring sufficient parameters to achieve the required performance while also eliminating costly system overlap.

Torque matching within 1% extends system life, reduces maintenance, and increases availability
In pinion systems, drive performance must be perfectly matched to achieve optimum torque control. Siemens configures dual drives in a proprietary arrangement, assuring optimal torque sharing and eliminating torque disturbances across the line. The resulting smooth motion prevents the gears from chattering, causing gear teeth to wear or even break. Siemens designs its drive systems to guarantee precise torque sharing, exceeding virtually all engineering requirements.

Variable Speed Drives offer simplified inching and maintenance functionality
Inching drives from Siemens allow the mill to rotate very slowly, enabling maintenance workers to safely replace the liners within the mill. This mode makes maintenance faster, easier and saves energy since it avoids restarting the mill several times. Inchng can be done with a properly engineered variable speed drive, with a geared drive train and the main variable speed drive, or by an additional inching drive. Siemens offers either inching solution, depending on the customer’s requirements.

Typical IDS scope of supply

22 kV 1250 A CB
NJPUS C, metal-enclosed, Oil-Insulated
Switchgear
- motor operated Disconnecter Panel
- two Circuit-breaker panels
- OC/EF & Diff. Protection

Siemens Scope of Supply

24 Pulse Converter Transformers
22 kV / 2200 V, ONAN

SINAMICS GM160 (air-cooled)
Incl. Space-Heater, RTU scanner, incremental encoder and SINONET Q200 for accurate Loadsharing

6 Pole: 2 x 4160 V H Compact Plus SCIM
Incl. Space-Heater, PF100 temperature monitoring and HQ010 Pulse Generator

Flender gear unit
Incl. oil-cooler, couplings and pony drive