

### Ball Mill

A cylindrical or conical shell rotating about a horizontal axis, partially filled with a grinding medium such as metallic balls. The material to be ground is added so that it slightly more than fills the voids between the pellets. The shell is rotated at a speed which will cause the balls to cascade, thus reducing particle sizes by impact.



# All balled up!

*A huge 1000 HP, 240 RPM, 2300 Volt ball mill motor, with a rotor over 7 feet in diameter, survived for a long time in the harsh confines of a milling operation until a small unforeseen chain of events took over.*

*One (or more) of the steel balls escaped from the mill and found their way near the motor itself. After that it was just an instant until the spinning bouncing ball was attracted by the magnetic field and made contact with a BANG...one motor destroyed in a very big way!*

When Longo received a call about this problem we quickly provided the company with a time table for the repairs. Since the motor was a vital component in their operation, we put this into an emergency program with a very quick 18 day turn around. Upon agreement, we immediately dispatched a truck to the site for pick up.

Upon arrival at our Wharton facility the damage to the motor was immediately obvious with eight rotor winding poles burned out, stator windings blown open and twisted, plus total destruction of the stator laminations. Measurements and data for the windings were taken before the dust had even settled and preliminary calculations, parts list and procedures were set up. Engineers and shop personnel teamed together so that everyone was on the same page from the start.

Once the initial observations were complete, we disassembled the damaged stator to inspect for

any damage not visible at first sight. We hate surprises as much as our customers do. The winding connections, along with the insulated surge retainer ring, were quickly cut away to gain access to the slot wedges and windings. The combination of age and dust had the wedges and windings held very tight, so the 9 ton stator was promptly moved to the power cleaning booth. Our 15,000 psi water blaster removed the accumulated dust, residue and wedges; then the stubborn windings could readily be removed.



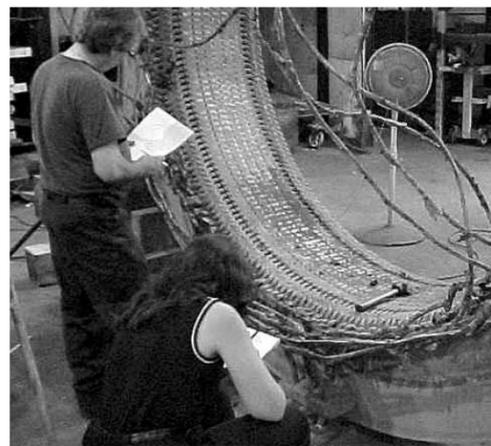
After the winding removal, the disassembly of the damaged stator laminations begins.

When the laminations were examined it was discovered there were four different segment patterns dictated by the geometry of the frame and the slot arrangement. While this may be unconventional, there was not time to consider a different design pattern, so the exact duplicates

Safety and security in our shop are as important as the quality of work we do. Motors and pumps come in from all sorts of environments - plain water to nasty waste. Procedures to deal with this are integral to our process. Cleaning of these pieces with non-toxic compounds mixed with water under 15,000 psi goes a long way to ensuring they are clean and safe to work on.

were laser cut and promptly delivered to Longo for installation. Once the installation pattern was

Winding group leader and engineer determining connections of stator winding.



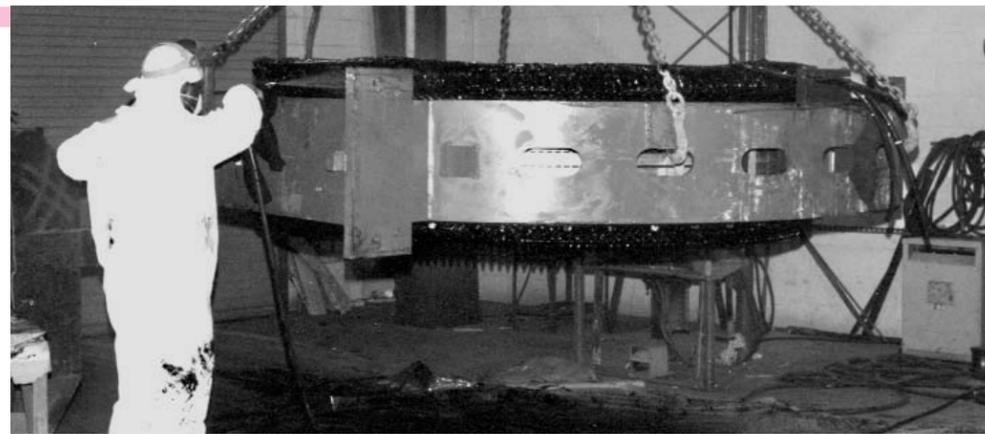
Lamination disassembly nearly complete.

established, the stacking of the stator with the new laminations went quickly and smoothly.

Whenever situations like this arise, we stay in contact with the customer so that they are fully informed. This eliminates any confusion or misunderstandings as to what is required and what has been accomplished, particularly when the project was moving along as quickly as this one did. **Another example of a Longo Process Advantage: experience to handle the unconventional and maintain constant communication.**

Once in-house, the rebuilding of the stator could get underway. With the stator laying on its side, two men were able to comfortably walk around the inside of it installing the laminations. Individual centering posts, trapezoidal in shape, held each one in place. There were twelve 30 degree, 22 inch long segments per layer. They were stacked in multiple layers with cooling ducts in between. A total of 5200 individual lamination pieces were needed to complete this job.

The preformed windings were securely fit into place and then locked in with new fiberglass



Abrasive-resistant spray being applied.



Relamination completed, new windings installed, the motor leads are installed.

wedges and spacer bars. The windings were supported with packing between each coil and laced together with wrapping material. Our proprietary coil bracing system was employed to forestall coil movement on startup and while running. The full load torque is 21,875 pound feet, which translates into a force of 6100 pounds on the coils.

There is no automatic machine for this type of work, just experienced and capable hands. The winding rope or surge ring is placed around the circumference of the stator windings. More packing and wraps are applied, tying each of the coils to the surge ring and to each other to distribute and handle the extreme forces mentioned above. Again, experience is key to "not too tight, just right." **Another example of a Longo Advantage: the craftsmen's touch.**

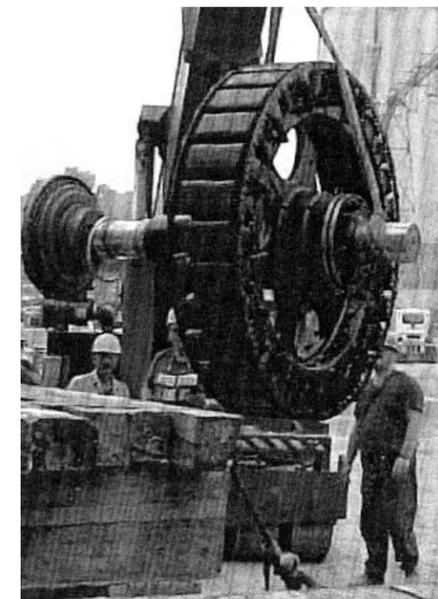
Since this motor was going back into that dusty and grimy environment, we recommended additional protection for the windings. An abrasive-resistant coating was applied over the windings, building up a protective shield that is resilient against the impinging dust particles. Without the coating, the windings would not last anywhere near as long. **Another Longo Advantage of thinking ahead and not just merely doing the essentials.**



Mechanic and supervisor tighten rotor pole bolts using hydraulic calibrated torque wrench.

performed to be certain the units were correctly remanufactured. When the motor was reinstalled and the rotor was placed into its pedestals, alignment problems were discovered. Longo's state-of-the-art techniques, like laser alignment, were not viable in this situation. Using old fashioned dial indicators and feeler gauges we were able to define these issues. With the customer's able support this was resolved and the unit prepared for startup. **Another Longo Advantage of defining issues and sticking with a job until it is done right.**

The customer, previously unaware of the misalignment problems, was most pleased with



Rotor rigged at job site.

Longo's attention to detail throughout the project and requested that we go over his other motors with the same thoroughness.

*We compete with other suppliers on bids, specs, etc. We win some on straight price and we also win a lot of business because we do have certain advantages. When the unit involved is pivotal to an operation, many of our customers choose to use Longo exclusively. They want the rigor, the discipline and the process (formal work plans) employed. This is in spite of cost considerations.*

*They feel it is definitely worth it.*



**LONGO**  
Your source.....your resource.

Note: The final installment of "Replace or Repair" will appear in our next issue of the Longo Letter.