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Zero-Downtime, Phased Plate Mill Drive Upgrade

Capital equipment expenditures in the steel industry trend upward yet spending approvals are scrutinized more than ever. Production pressures also preclude extended mill shutdowns for upgrades.

Reliability and productivity improvements were required at Mittal Plate's Coatesville, PA 140" Plate Mill (see Figure 1) but extended downtime to implement a conversion was not available. Capital funding for projects is also highly contested among the Mittal mills.

Mittal's Central Area Maintenance group formulated an economically feasible plan using plant personnel for installation and startup. This kept capital costs down, Return on Investment high, and ensured project approval. A zero-downtime, phased upgrade was implemented within the existing mill production schedule.



Figure 1 – Mittal's 140" Plate Mill

Unacceptable Downtime

One of the largest problem areas on Mittal's 140" Plate Mill were the 1970s vintage, obsolete, analog drives on the Tables. Production-limiting downtime was high due to component failures and aging potentiometers that required frequent maintenance. This was compounded because the old drives had many parts and connections making troubleshooting harder.

Repairs had traditionally been done in-house but reductions in manpower moved these repairs to outside vendors. The costs were unacceptable and added to delays in repairing the mill.

By the end of 2001, the downtime had reached 3,661 minutes (61 hours) due to the drives alone. It was estimated that this downtime had cost the plant over \$500,000 in lost production. Another \$50,000 was spent on parts and repairs for the drives.

These are common situations facing steel mills today and companies like Avtron Manufacturing have developed specialized digital drive control upgrades for these applications.

The Big Picture

The plant maintenance personnel planned a project based on the following project goals:

1. Replace the obsolete drives with new, digital drives to eliminate downtime. Replace the least reliable drives first to immediately show improved reliability and to scavenge spare parts stocks for the remaining drives.



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2. Formulate specific evaluation criteria to rate the currently available drive technology and select the most reliable, easiest to use drive available.
3. Install and start up the new drives using in-house personnel in a phased manner within the existing mill production schedule to minimize lost production.
4. Ensure the project is implemented smoothly, on-time and under budget so management "buys into" an ongoing replacement program.

Formulating a Plan

The plant received project approval in 2002 by demonstrating to management that they could save 50% of the downtime and parts and labor costs associated with the drives.

A 10 man team was formed consisting of Maintenance, Process Control, Engineering, and Rolling Mill personnel to select a vendor and formulate the project plan. The team needed a vendor that had a track record of successful installations and reliable performance in the metals industry.

The mill gathered quotations from 7 potential drive suppliers. The team evaluated the bidders based on the following criteria:

1. Reliability
2. References
3. Backward compatibility
4. Track record of supporting older models
5. Maintainability
6. Spare parts minimization

7. The overall technology of the control solution offered

The team formed an Evaluation Matrix and used it to rank the bidders in more detail before the final selection was made. When the team completed its evaluation, they selected Avtron Manufacturing in Cleveland, Ohio for their drive vendor.

After the contract was awarded, the plant team and Avtron developed a comprehensive, phased upgrade plan for the project.

Project Implementation

Mittal implemented this major upgrade to the mill's drive system by utilizing their own mill personnel without involving outside contractors and vendors. They implemented the upgrade during normal mill outages without incurring additional mill down time. Until recently, undertaking a project of this magnitude in a phased approach using only in-house personnel was considered too risky.

The original project was approved based on the replacement of 12 drives and the vintage logic controls associated with them. These drives were located in the Plan F Attic and the mill-level Electrical Control Shanty.

These drives were upgraded through a multi-phased approach beginning with the Attic drives, which had the highest amount of downtime. This significantly reduced the downtime and created adequate spare parts stocks for the other old drives.

In order to make as many drive improvements to the mill as possible within the capital available, the plant did all of the



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installation and startup work using mill personnel.

Phase 1
Replace the 8 Drives in the Attic Line-Up over Multiple Outages

There was only room to mount three new cabinets while the mill was running so a comprehensive, multi-phased upgrade for the 12 drives in the room was the only solution.

The team came up with a plan to temporarily install and start up several individual sections before “shifting” them to their final resting place. This involved installing three new drive cabinets that could fit into the existing space and then start them up over two outages.



Figure 2 – New Drives in Attic Line-Up

Once the first set of cabinets were installed, Mittal could then systematically replace the old drives so additional new units could be mounted. This installation task was made easier because all of the existing drives were 300 or 500 HP and the

Avtron drive package was the same physical size for these ratings.

In total, 6 individual monthly shutdowns were used to upgrade the 8 drives in the Attic Drive Room (see Figure 2).

Phase 2
Replace the 4 Drives in the Electrical Shanty on a Single Outage

The new drives would not fit into the existing room with the current room access and layout. The team decided to rearrange the room so they could remove a wall, mount the drives in place of an existing storage area and rebuild the wall behind them.

After the first phase of the project was completed, the crew had gained enough experience that these four drives could be upgraded in one outage. The installation plan allowed these four drives to be mounted in their final resting place so detailed pre-installation and wiring work could be done while the mill was running.



Figure 3 – New Drives in Shanty Line-Up



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An Unqualified Success

The first two phases of the project have been a success. The upgrade program met or exceeded all goals for project.

1. The reliability of the new drives has eliminated 75% of the drive delays caused by the old system, exceeding the project goal of a 50% reduction and saving over \$400,000 per year in lost production.
2. There have been zero “infant mortality” failures and zero delays attributed to the Avtron drive hardware since installation.
3. The mill has saved tens of thousands of dollars in capital costs by performing the installation and startup themselves. The result was enough capital left in the project to proceed with the upgrade of four additional drives.
4. The improved reliability, savings and success of the project have sold management on the benefits of continuing the replacement of the older drives in the mill.

Mittal has been extremely pleased with the success of the project. It has exceeded the original project goals. The success of the project can be attributed to the skills of the mill maintenance people to do the work themselves coupled with the drive features and ease of implementation inherent in the Avtron ADDvantage-32 Digital DC Drive.

In addition, the success can be attributed to the excellent working relationship between the responsible project people at Mittal and Avtron. This close cooperation and the clear communications

between Mittal and Avtron on the project have resulted in a management willingness to continue the upgrade of the other drives using Avtron.

This upgrade not only exceeded the project goals, it put the building blocks and system architecture into place for the eventual replacement of all of the drives on the mill.