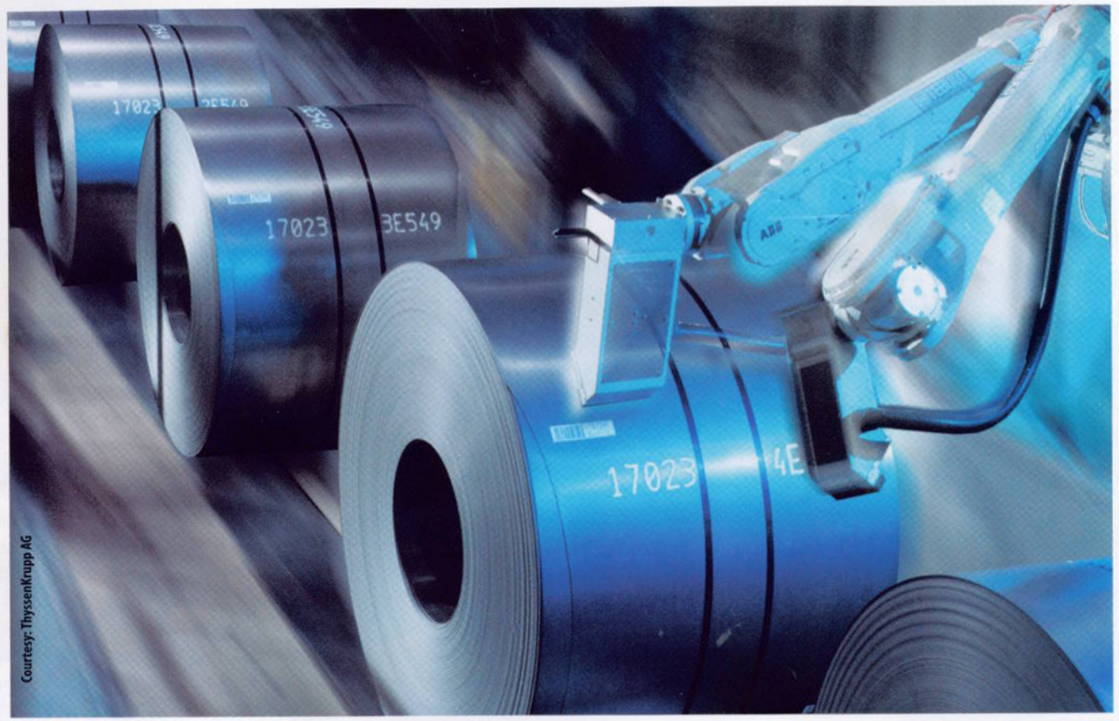
# Better steelmaking

## Optimising steel plant operations requires that we address various aspects of process, operations, methodology and related capital expenditure




Courtesy: ThyssenKrupp AG

**Inside a steel plant it is a whole new world with myriad processes that go into turning iron ore to finished steel products. Bringing in efficiency and order in this complicated world is a daunting challenge for automation systems. Here's in a nutshell, the scope of application and implementation principles for automation in this industry.** ■ Atanu Mukherjee

***Atanu Mukherjee***
*President, Technology Consulting*
*Dastur Business and Technology Consulting*
*atanu.mukherjee@dasturco.com*

Addressing the subject of optimising operations in a steel plant remains incomplete till a few questions are not answered: What are the levers to increase the plant throughput with minimal capital expenditure? Can a phased plant-wide automation strategy be developed considering planned equipment and other technology upgrades? What other capital projects should be undertaken to achieve the next level of improvement? What are the potential savings opportunities, risks and implementation complexities of these improvements? What are the timelines for achieving these results?

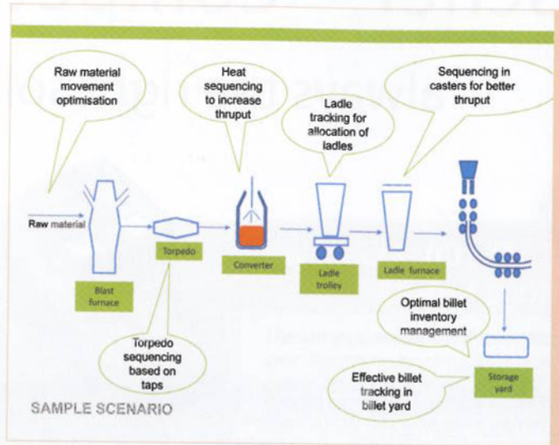
### Areas for improvement

Inventory optimisation, cycle time reduction, material movement and logistics along with automation are the typical areas to be explored for improvement while planning optimisation. In our experience management of inventory across the production chain can yield significant results. Inventory management in steel operations is complicated by the nature of steel making process from iron and steelmaking to rolling due to the nature of material transformation. Inventory optimisation ensures a low work-in-progress and finished goods inventory. Along with reduced shipping time between steel making and mills, improved visibility through better real-time tracking across shops coupled with spare parts inventory management, in turn, lead to reduced working capital requirement.

Cycle time reduction entails reduced time between handoffs in converter shops and mills, reduced test time through better integration with test instrumentation and laboratory management systems, improved billet/slab sequencing in reheat furnace area and minimised re-setup time in mills, thus increasing plant throughput.

Better material movement and plant logistics results in improved shop production efficiency. This area draws attention to the movement of products between casting and rolling mills, evaluating options of capital investment on raw material and its scheduling and the hot metal wait time between blast furnace and converters. Additionally, careful planning of material routing and movement reduces capital expenditures on fleet like locomotives. We find that simulation exercises are an important mechanism to design efficient material movement and logistics plans.

Automation when leveraged well improves plant wide efficiencies. It increases operational efficiency and flexibility by reducing manual intervention while increasing flow. Automation should be implemented starting from instrumentation right through MES and ERP with integrated systems across all levels in a phased manner with careful consideration to return on capital (ROI).




**Process optimisation across SMS, casting & mills**

### Implementation principles

It is important to understand that automation is not a silver bullet; however, when preceded by process improvements, its efficiency is multiplied.

Process improvement, when implemented in phases, bears lesser risk compared to a big-bang approach which is marked by larger upfront investments and resource deployment, uncertainties in realisation of the full project, coordination complexity and most importantly higher cash flow drain. The phased approach on the other hand prioritises implementation thus making way for benefits much faster; it minimises risks through progressive learning and better visibility and facilitates progressive deployment of resources which helps limit the project if required.

An integrated system across operations is another important dynamic in a steel plant optimisation. In contrary to shop specific solution, integrated solution is characterised by inter-shop coordination, global optimisation, integrated islands of automation, better end-to-end yields, and better cash flows. An improved cash flow and working capital needs is always set as one of the most important objectives; and the phased approach devises just the right process to meet this objective. This approach minimises capital intensity by extracting maximum operational efficiencies. In this process, capital improvement projects are incrementally deployed and operations are re-optimised to leverage new improvements thus maximising returns on current assets.

### Prioritising

The first focus in approaching plant-wide integration has to be on process improvement and basic automation, involving material movement and logistics optimisation, process optimisation across SMS, caster and mills, laboratory cycle time reduction and test integration, transport process optimisation, overall automation roadmap and implementing level 1 automation upgrades where required. The next focus can be on level 2 automation and manufacturing execution system (MES), and finally leveraging IT across all functions. MES involves level 3 automation, while supply chain management constitutes level 4.

### Firming up the scope

The first step of implementation defines the scope of blueprint exercise, identifies specific process improvement and automation projects to be taken simultaneously, firms up the process improvement analysis areas and tunes the engagement model for the levels to follow.

The second step has two functions operating simultaneously – automation and operational process. Implementation plan is the final step, scope of the implementation complexity is identified followed by the plan migration strategy. The cash flow is then analysed and the financial model created. And finally the change management process is defined. Improving and optimising existing steel plant operations requires that process analysis be integrated with automation system design. Careful analysis and planning are required for such projects to succeed. This also means that a thorough analysis on return on capital, cash flow is also undertaken. And finally implementation of such projects should be in a phased manner to minimise risks and maximise the return on investments. ■