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Simulation for Steel Melt Shop capacity and throughput analysis for an integrated steel plant

Case viewpoint:

Situation: Due to rising domestic demand of rebars and increased requirement of cast steel billets, a North African steel firm planned to increase production capacity of long products and explore options to increase liquid steel production from existing melt shops. The company, an integrated iron and steel plant is based on direct reduction – electric arc furnace (EAF) route. Expansion plan for the steel melt shops is based on the already established route with existing & proposed equipment, its operating assemblies and related auxiliaries. DBTC was asked to verify & validate the modifications suggested in the expansion report using simulation techniques.

Objectives: DBTC consulted with the company to make better informed decisions regarding the plant capacity and resource requirements. Objectives included:

- Develop a simulation model of the facility in order to identify bottlenecks
- To check, if up gradation of EAFs to 90 MVA will produce the required cast steel with the existing casters with the proposed cast heat sequences
- To check the adequacy of existing 2 EOT cranes in the ladle transfer aisle for ladle handling
- Utilization of current facilities
- Analysis of how minimization of current operational delays can result in improved production

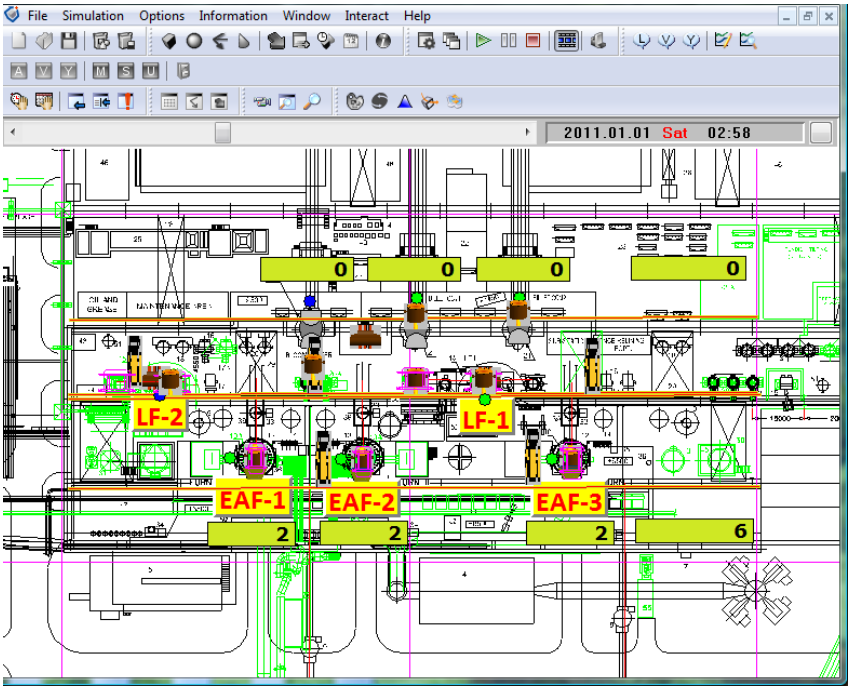
Solutions**:** The Steel Melt Shop (SMS-1) facilities included

- 2 scrap charging cranes
- 3 Electric arc furnaces
- 2 Ladle Furnaces
- 1 Ladle treatment furnace
- 2 EOT cranes in the ladle transfer aisle
- 3 Continuous casting machines

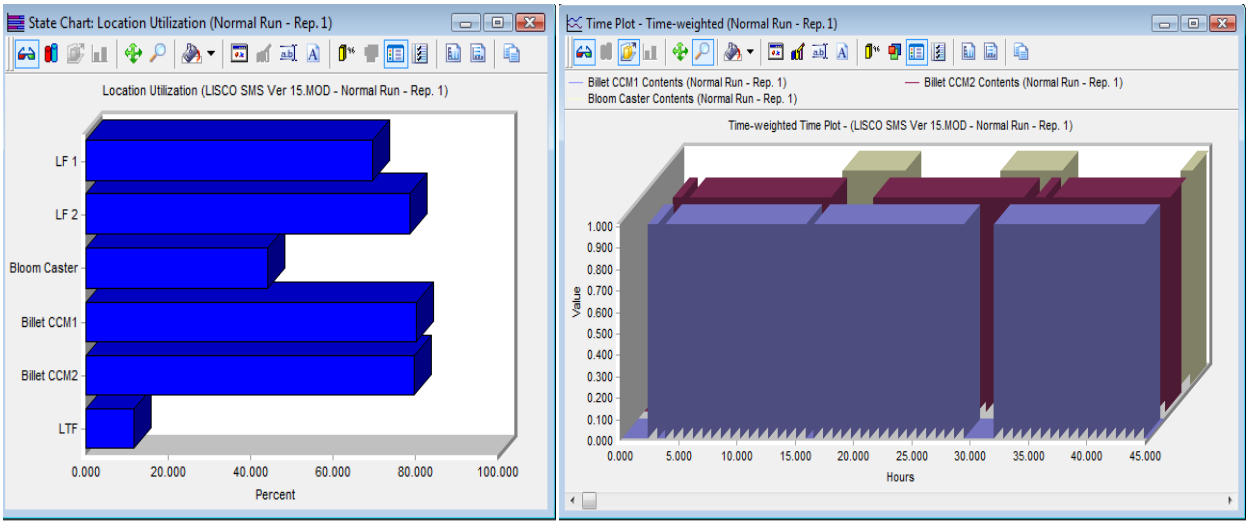
First, a discrete event simulation model was developed with 2 cranes in the ladle transfer aisle based on the past production pattern mapped to the proposed production. The model could not produce the desired quantity of liquid steel and it was determined that the ladle transfer aisle was the bottleneck, as this was creating a blockage for the EAFs resulting in increased tap-to-tap

time. This also resulted in frequent breaks in the casting heat sequence and henceforth additional cost incurred for caster preparation.

As discussed and agreed upon, one more EOT crane was introduced in the ladle transfer aisle and the model was re-developed.



Now, the new model showed, it could produce the desired quantity of steel and maintain a fair cast heat sequence with a acceptable utilization of the facilities.



The next point of concern was how delays could affect the production. What-if scenario analysis was carried out on various internal and external delays. The model was run with combinations of internal and external delays in the existing system and analyses were made how this could affect the target production.