

## Cost Savings for Metals Producers

In this issue we focus on tools and techniques which can reduce the cost of metals production, and increase productivity

The newsletter for steel and aluminium producers from Broner Metals Solutions – dedicated exclusively to business solutions for metals production

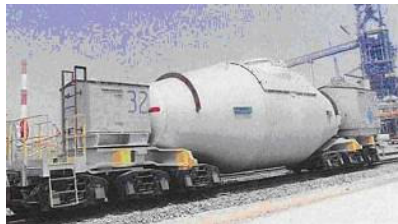
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## Minimise Cost and Maximise Productivity by Improving Material Flow Management from pig iron to caster

Controlling the flow of material from pig iron to steel, to secondary steel making, to Slab/Billet casting is a complex and challenging task that can have a big impact on plant productivity and costs.

If the supply of liquid steel is the bottleneck,



then it may not be possible to run the casters continuously

and planning the timing and duration of a casting sequence will be critical to controlling production cost. In this situation, the ideal solution is to plan a casting campaign where start of casting is delayed until the maximum inventory of liquid iron and liquid steel is built up. Then casting is started and the inventory gradually reduced. This will produce the maximum sequence lengths considering the available iron and steel. However this kind of campaign means that the lead time for each heat will be different and therefore the temperature profile for each heat will also be different as earlier heats in the campaign will have more time to cool than later heats. To manage this, heats at the start of the campaign will need to be tapped at a higher temperature to compensate for the extra lead time and heats at the end of the campaign will need to be tapped cooler as the steel will move more quickly through the plant.

In this kind of pacing solution, it can help a lot

to optimise the campaign by dynamically integrating temperature profiles, inventory and casting speed in one process model. This will allow the maximum sequence length to be produced without risk of sequence breaks or ladle re-heating or casting pig iron.

If the casters are the bottleneck, similar considerations apply, in order to ensure that liquid metal arrives at the casters at the correct time and temperature and with a minimum of ladle re-heating.

The Broner Melt Shop Control Centre (MSCC) module manages these processes, and provides a steel plant pacing solution which:

- Controls liquid metal flow and fore-

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## Reduce Re-Heating costs by increasing % Hot-Connect

Hot Connectivity is the process by which continuously cast semi-finished steel is rolled without it being allowed to cool to ambient temperature between the casting and rolling stages.

Hot Connectivity reduces energy use, material handling, and inventory.

The Broner scheduling solutions provide a flexible set of approaches to improve Caster-Hot Mill synchronisation and increase the % of material that can be scheduled for Hot

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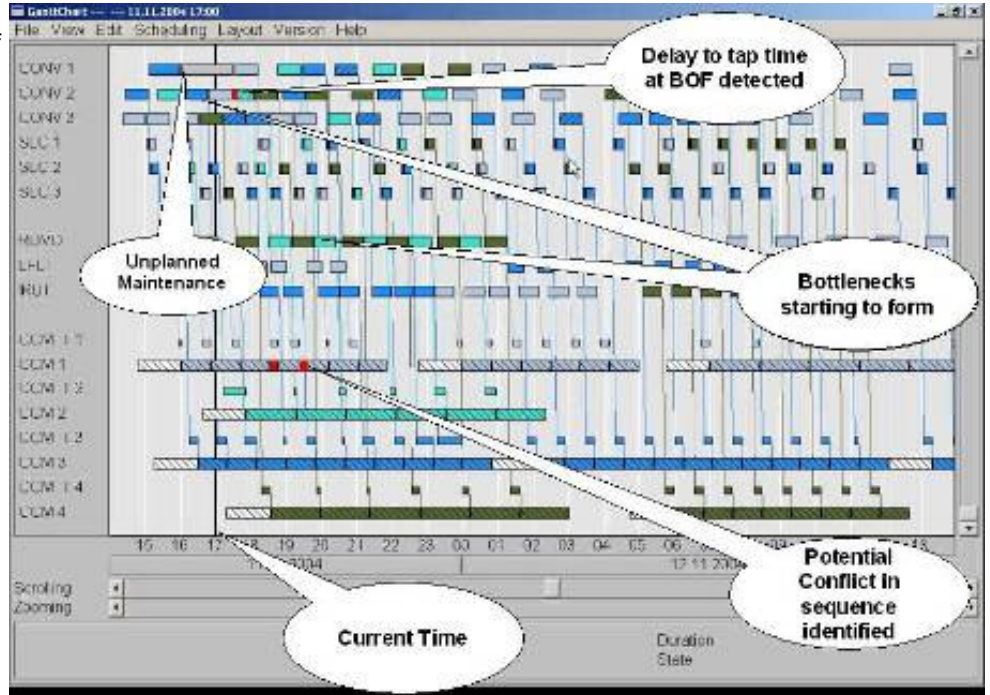
# Minimise Cost and Maximise Productivity by Improving Material Flow Management from pig iron to caster

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casts pig iron stock based on the planned casting sequence. It can include automated alarms when liquid iron inventory becomes too high or too low. It balances the consumption of steel at the caster with availability of liquid iron.

- Minimises the chance of unplanned sequence breaks to minimise cost and maximise productivity
- Minimises last minute changes to casting speed to avoid quality issues
- Achieve the 'aim' casting temperature to minimise the cost for re-heating and to eliminate breakouts at the caster
- Temperature model, that considers thermal loss or gain during transport and other processes, helps improve the optimisation of pacing by calculating how long ladles can be kept waiting without the need for re-heating due to timing issues.
- Gantt-chart visualisation for the Melt Shop Coordinators that shows the current production situation and displays real-time alerts about future conflicts that could lead to sequence breakdown. This allows time for operators to take avoiding action.
- Re-scheduling functionality that helps to solve conflicts and provides an off-line

"what-if" capability to evaluate the best way to manufacture the scheduled heats considering the current and expected



liquid iron availability and other plant conditions.

Scheduled heats and sequences received by MSCC from the caster scheduling system may be adjusted by the operator based on current steel making conditions. The user can determine the optimum steel making plan and start times for casting sequences for the next hours considering optimum casting speed, grades and sections that need to be cast, the availability of liquid iron and planned or cyclical maintenance. Once the heat / steel making plan is finalised, then it can be made live for actual production.

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In live production, MSCC is constantly communicating with plant automation systems to monitor activity. The schedule is displayed in real-time on operator terminals in each plant control room, from iron making through to casting, to provide latest information on the required timing of each heat. MSCC sends heat schedules and grade requirements to each production station and receives events such as: torpedo car contents, torpedo car location and movements, heat start, heat finish, tap temperature, breakdowns, crane availability, ladle condition & availability.



# Reduce re-heating costs by increasing % Hot-Connect

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Connect.

## Opportunistic Hot Connect.



Broner Hot Mill Scheduler makes work available for scheduling based upon casting times, transportation times, processing times, and user defined hot/cold connect durations. It calculates when material is available for rolling at any point in the plan, either as hot connect or cold connect. Users can then determine the types and quantities of work available at any time, and select suitable hot or cold groups of work to be scheduled. It also provides user definable rules to ensure minimum rolling quantities of hot or cold connect

work, prioritise different types of work, and determine what types of material can be mixed or grouped together for rolling.

## Caster-driven Hot Connect

The Broner Caster Scheduler and Hot Mill Scheduler are integrated with each other to assist in the process of Hot Connect. As work is scheduled by the Caster Scheduler, the status and timings of slabs are automatically updated within Hot Mill Scheduler. Thus, Hot Mill Scheduler can create schedules based upon the most up-to-date caster schedules, that can follow the scheduling rules of the caster.

## Hot Mill-driven Hot Connect

Hot Mill Scheduler users can also create schedules of work using works orders that are planned for, but not yet scheduled, by the caster. Such work can create "provisional" schedules that can be fed back to the Caster Scheduler for prioritisation. Users of the Caster Scheduler can then preferentially create caster schedules based upon these Hot Mill provisional schedules. Once this is done, the caster schedules are automatically updated in the Hot Mill Scheduler which can allow provisional schedules to be issued or re-scheduled based upon actual caster schedules.

*The Broner scheduling solutions provide a flexible set of approaches to improve Caster-Hot Mill synchronisation and increase the % of Hot Connect material*

## NEW: Technical Warehouse Management System specifically for Metals

Broner has announced a Technical Warehouse Management System with a powerful visual interface designed specifically for the most demanding of stockyard management requirements in the metals industry.

Effective management of piece movements and storage is now even more critical, in order to meet increased demands for better customer service and reduced costs. The Technical Warehouse Management System (TWMS) improves business operations by:

- Improves delivery times.
  - Reduced handling and quicker loading because storage is optimized
- Improves productivity.
  - Complete knowledge of all stock, avoids having to remake stock pieces that could not be found
  - Optimised storage increases turnover of material
- Improved quality, because of reduced damage caused by incorrect stacking, reduces need for re-work

- Improved safety
  - Safe stacking reduces losses caused by accidents



Typical crane driver view in a slab yard. Angle of view is changing depending on crane sensor data (position).

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# NEW: Technical Warehouse Management System specifically for Metals

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In contrast to the handling of standard warehouses like high-rack facilities or stockyards of pallets, the management and control of a ware-

house in the steel industry is quite a complex task. There are no standard rack heights, abc zones or storage and retrieval vehicles with fixed handover positions.



Typical coil yard view. Different piece characteristics can be represented by different colours.

Pieces (slabs, plates etc.) are typically stacked on top of each other, while a suitable storage location must be defined for each item individually, in the light of the actual geometrical structure of the warehouse as a whole, as well as regarding optimization aspects and warehouse restrictions.

The Broner TWMS is a highly flexible and modular solution that is designed to meet the special characteristics of each individual metals plant. It has the capacity to manage the most complex stockyards, as well as for high-rack facilities, and is fully integrated with RFID terminals and networks. For example, one system has 50 stock bays, and 70 cranes.

The Broner solution is a “Technical” Warehouse Management System because of its advanced technical features, which distinguish it from more traditional warehouse systems.

The Broner TWMS: takes into account the physical properties of individual pieces before choosing a location; has interfaces to various sensors like position measurement systems, load pins etc, and provides automatic operator guidance.

A core feature of the Broner TWMS, is an interactive 3D graphical representation, which allows an intuitive interaction between the operator and the system. This includes powerful visual facilities for crane drivers, with position-dependent online graphical representation allowing crane drivers to see the exact location of the next piece to be picked. The system

may even control fully automated gantry cranes and automated internal transport vehicles.

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may even control fully automated gantry cranes and automated internal transport vehicles. Broner’s suite of solutions for inventory and warehouse management for metals, now provides an increased range of capability that will meet the widely varying requirements of all metals plants. The Broner MES Inventory Management modules, optimise logistical processes by monitoring and managing work-in-process and finished goods movement, storage and shipment.

The TWMS solution integrates with the MES Inventory Management functions, and is designed specifically for those users who require a more detailed and sophisticated solution with a strong visual interaction to give additional control of the stock picking and placing processes.

David Mushin, Chief Executive Officer of Broner, said, “The TWMS solution is a significant extension to the Broner range of metals solutions, which we are currently implementing for ThyssenKrupp in USA, as part of a complete planning, scheduling, MES and warehouse management solution.”

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## Reduce inventory by improving Caster-Hot Mill synchronisation

It is important in any scheduling process that there is effective synchronisation of the schedules for each piece of equipment all the way down from the Caster through the Hot Mill to the finishing lines. This is particularly important for the Hot Mill, which is typically the bottleneck in the production process.

One technique that can have a big impact is Virtual Slab Scheduling. This provides a means for the 'ideal' scheduling requirements of the Hot Mill ("virtual" schedules) to be fed back into the scheduling process for the Caster equipment, in order to ensure that you are producing a greater proportion of what you actually need, thus reducing inventory and improving yield.

The Broner Caster Scheduler and Hot Mill Scheduler modules allow you to implement a "hot-mill pull" for slabs from the caster, thus im-

proving synchronization of the casting & rolling operations and reducing inventory of intermediate slab stocks.

These "virtual" Hot Mill Schedules are built before the slabs are cast or scheduled, in order to

generate the ideal mix of slabs to cast from the hot mill standpoint. You then use the 'Virtual' hot mill schedule to prioritize slabs for casting so that heats are filled with slabs needed by the hot mill more frequently.



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