Cost-saving sinter-plant solutions offer a host of benefits for producers

Agglomeration Of Benefits

Can sinter-plant performance be improved without major investments? Yes it can. A number of easy-to-install, stand-alone and practical solutions are available from Siemens VAI at relatively low costs to help producers optimize operations. All of the described equipment units and systems are installed in existing plants and well proven. Your best bet is to let Siemens VAI inspect your sinter facilities and to show you what improvement potential lies in store. All in all, the benefits add up!

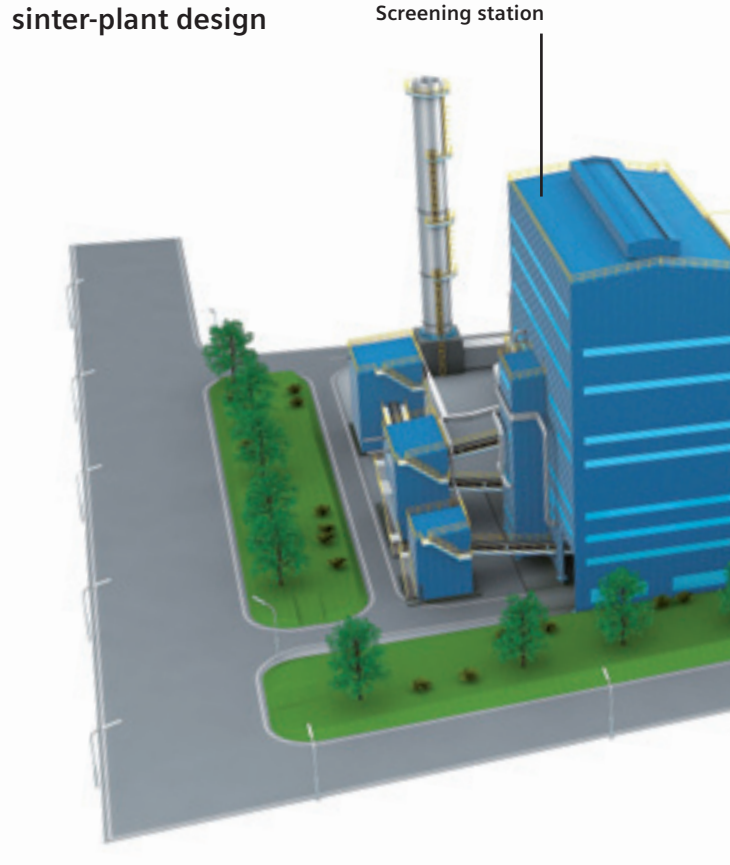
Intensive mixing and granulation system

High homogeneity and permeability of the sinter raw mix are key factors for achieving maximum sinter productivity and quality at low energy consumption. With conventional mixing drums, however, the homogeneity of the sinter raw mix is less than ideal. Siemens VAI has therefore developed an intensive mixing and granulation system to improve previous design solutions. The new system basically consists of a high-speed intensive mixer and horizontal granulation drum. The sinter raw materials (coarse and fine iron ores, ultra-fine ores/pellet feed, additives, dusts, solid fuels, return fines and recycled materials from the steel plant, etc.) are continuously fed to the mixer where macro- and micro-mixing of the sinter raw mix takes place. The material is then transported to the granulation drum. Thanks to the extremely high homogeneity of the resulting sinter raw mix, overall sinter quality is improved, which contributes to better blast-furnace performance.

Main benefits

- Lower investment costs compared to conventional systems
- Mixing of higher ratio of fine iron ore possible, e.g., pellet-feed concentrates
- Reduced solid-fuel consumption during sintering by up to 5%
- Increased sinter productivity by up to 2%

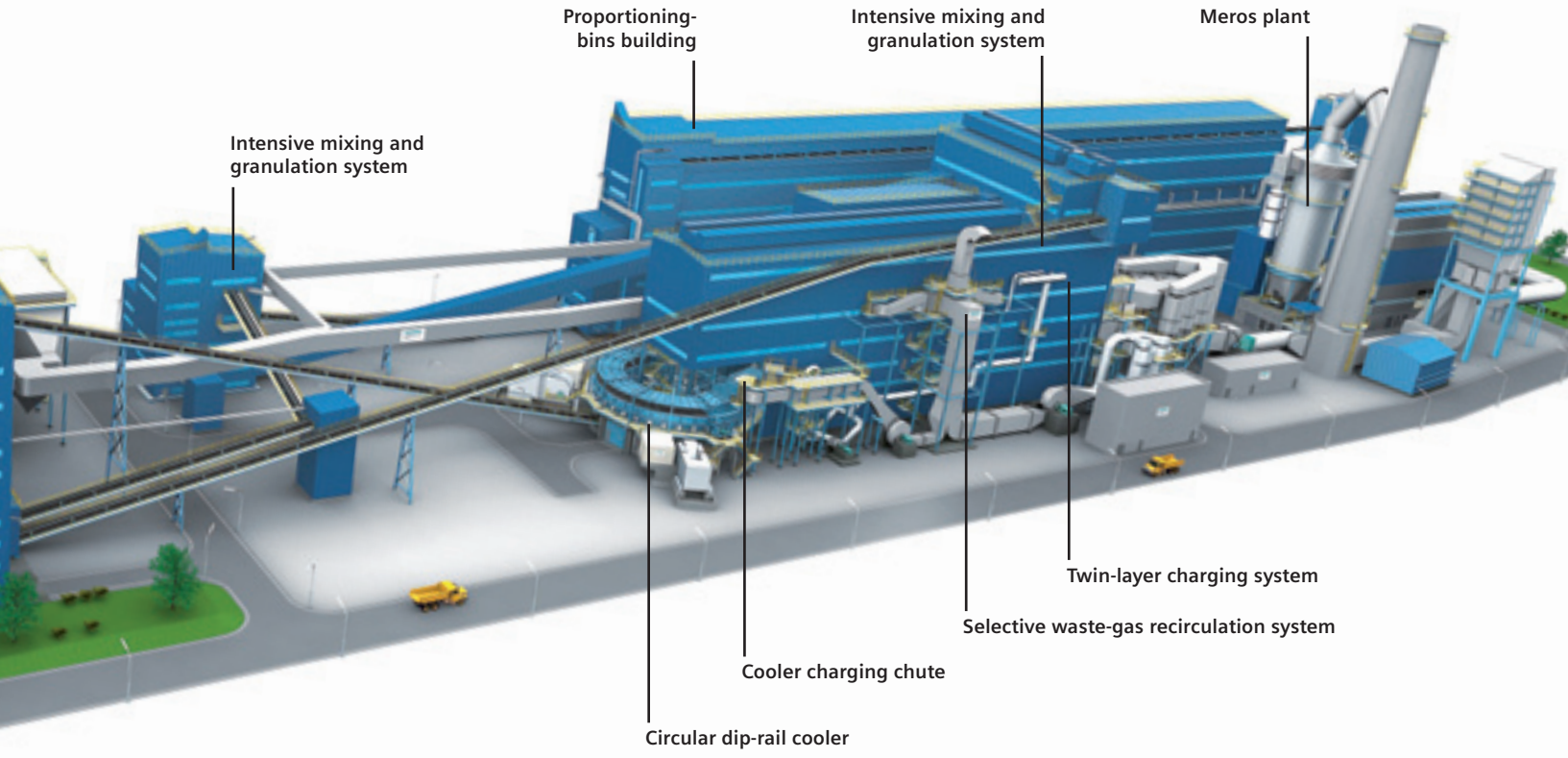
Schematic overview of sinter-plant design



Twin-layer charging system

The twin-layer charging system from Siemens VAI is a simple and practical solution to achieve a more uniform sinter-feed segregation and improved permeability of the sinter bed with respect to the material grain size and solid-fuel content. The initial layer deposited onto the bottom of the sinter bed is comprised of a coarser sinter raw mix with a lower solid-fuel content. The second layer is charged onto the top of the first layer and is comprised of smaller grain sizes and a higher solid-fuel content. These

With an experience background based on the implementation of numerous sinter-plant projects during the past five decades, Siemens VAI is one of the leading suppliers of sinter-plant technology and all related automation, media and environmental facilities. A full range of design, technological and system-improvement packages are also offered that enable producers to enhance performance, product quality, lower environmental emissions and, above all, reduce costs.



measures improve the permeability of the sinter raw-mix layer, contribute to a more efficient use of fuel and ensure excellent ignition behavior.

Main benefits

- Reduced specific solid-fuel consumption
- Increased plant productivity, even with bed heights of up to 800 mm
- Lower specific electrical energy consumption estimated at 2 percent

Special pallet-car design

Sinter machines from Siemens VAI feature the use of so-called Grate Wings Pallet Cars. Gas-tight rim-zone covers are installed in the side-wall areas of the pallet cars, which significantly reduce the false air volume compared with conventional designs. This leads to a large reduction of the waste-gas volume and improved sintering of the raw mix at the side-wall areas. The result is a reduced quantity of return fines, contributing to enhanced productivity of the sinter plant.

>>

>> The sintering suction area can be easily increased at relatively low costs by increasing the width of the pallet car. This solution can be applied without the need to modify the supporting structure of the sinter machine, thus minimizing operational downtime for modification work. The sinter output can be increased by up to 12 percent in this way. Further capacity increases are possible by extending the length of the sinter strand. These steps represent highly economical solutions to expand the capacity in existing sinter plants.

Main benefits

- Reduced false air intake and waste-gas volume
- Therefore, lower electrical energy consumption by up to 12 percent
- Proven sinter output increase by more than 12 percent

Selective waste-gas recirculation system

Siemens VAI has developed and implemented new technologies that improve sintering operations and keep environmental emissions in check. One such example is a selective waste-gas recirculation system, jointly developed with the steel producer voestalpine Stahl GmbH (Linz, Austria). The offgas from selected zones of the sinter machine is mixed with cooler off-air and/or ambient air and recirculated to the sinter strand.* A key reason behind the development of this process was to enable increased sintering capacity without an increase in the offgas volume and emissions. Specific investment and operating costs for gas-cleaning facilities can therefore be kept relatively low. Specific emissions for each ton of produced sinter are also much lower than in conventional systems because recirculated dust is trapped in the sinter bed and organic compounds destroyed as they pass through the flame front. The selective waste-gas recirculation system from Siemens VAI is ideal for installation in both new and existing plants. Furthermore, in combination with the Meros* Process, this represents the best-available technology for the treatment of sinter offgas.

*See metals&mining 2|2008 for more details.

Main benefits

- Full productivity using same raw mix
- Decreased waste-gas volume by up to 40%
- Proven reduction in the solid-fuel consumption by up to 10%
- Lower specific CO_2 emissions by up to 10%
- Lower specific emissions of SO_x, NO_x, organic compounds and heavy metals

Sinter cooler charging chute

The efficiency of cooling air can be enhanced using a specially designed cooler charging chute. With this solution, an improved segregation of the sinter deposited onto the cooler is achieved in that large particles collect at the bottom and small- to middle-sized particles accumulate at the top of the cooling bed across the entire cooler width. This contributes to a more homogenous permeability of the sinter bed, better cooling efficiency and thus lower electrical energy consumption of the cooler fans. The described solution step can be implemented in existing coolers where the sinter-cooling efficiency is inadequate. Siemens VAI is capable of performing 3-D computer modeling and specific lab tests to determine the ideal improvement solution for the requirements of each producer.

Main benefits

- Increased cooling-bed permeability and cooling efficiency
- Therefore, reduced electrical energy for suction fans by up to 3 percent
- Less spillage in the charging area

Advanced sinter-cooler design

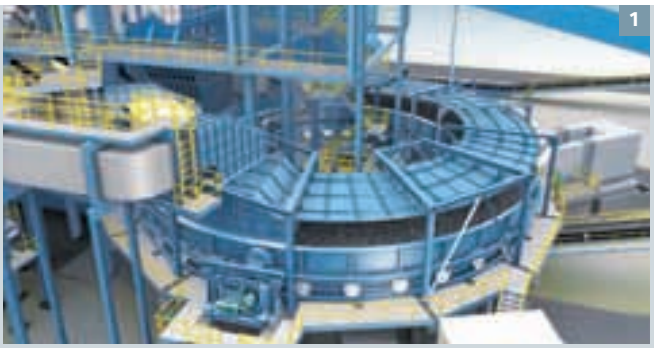
The sinter cooler is designed according to the patented Grate Wings Cooler Trough technology of Siemens VAI to meet the requirements for higher efficiency and lower electrical energy consumption. By means of special rubber sealings installed between the moving cooler troughs and the air-channel system, a more efficient utilization of the cooling air is possible. Spillage pans located below the lower plates of the cooler troughs protect the air channel from spillage and dust. Applying the new design in an existing conventional circular sinter cooler with a trough width of, for example, four meters, the cooling capacity can be increased by approximately 15 percent without increasing the cooling-air volume.

Main benefits

- Decrease of specific electrical energy consumption by up to 3 percent
- Higher cooling efficiency resulting in decreased specific cooling-air volume
- Effective utilization of heat-recovery system in combination with offgas recycling

Sinter VAiron

Installation of the Simetal^{CIS} Sinter VAiron automation/expert system in new or existing sinter plants is



1 Schematic representation of advanced sinter cooler
2 "Grate Wings" pallet-car extension
3 Principle of segregation with sinter-charging chute design
4 Eirich intensive mixer
5 Horizontal granulation drum
6 Selective waste-gas recirculation hood

the basis for reliable process control and optimized raw-material handling – from stacking and dosing up to sintering and material analyses. Key functionalities for the sinter process were developed to improve product quality and reduce overall production costs. Examples of control modules related to the raw-material composition include sinter-mix moisture and feed control, ignition control, burn-through-point prediction and deviation control, as well as basicity and harmonic diameter calculation. These lead to an increase in productivity with a simultaneous decrease in the coke rate.

Main benefits

- Proven coke-rate reductions by 2.5 percent
- Increased productivity by 3–5 percent
- Improved sinter-size uniformity

To improve sinter quality even further, the Level 2 Sinter Expert System for feedstock up to plant-specific fine-tuning represents an ideal analysis and optimization tool for plant technologists. (For more details, please refer to metals&mining 1|2008.)

Concluding remarks

In order for sinter producers to derive the most from the available improvement and optimization potentials, an in-depth analysis of the raw materials and process parameters is necessary first. A quick assessment of the existing plant conditions can be made during on-site investigations by expert personnel from Siemens VAI. This is then followed by recommendations for improvement solutions that are implemented on a cost-effective basis. ■

Authors
Josef Ebner, André Fulgencio, Stefan Hötzinger, Dr. Johann Reidetschläger
Contact
sinterplant.metals@siemens.com