Groundbreaking for a new generation of steelworks to be initially built in Arkansas, USA

The Mississippi river provided the inspiration for the name of the USA’s most recent and one of the country’s cleanest steelworks, Big River Steel (BRS) in Osceola, Arkansas. When the foundation stone was laid on September 22, it was also a milestone for a new generation of steelmaking plants.

Big River Steel and SMS group intend to set new standards for tomorrow’s steel production. What the name additionally references apart from the location on the banks of Ol’ Man River is the massive flow of goods that is going to travel on the waterway to and from the flat-steel plant. It is also an allegory for the course of the liquid steel through the impressive, 1.6-million-dollar project that represents a step up in the USA steel industry. Applying innovative, clean, and energy-efficient processes, the company will produce high-quality steels for the energy, automotive, oil and gas industry from recycled steel scrap. These materials will contribute significantly to achieving President Barack Obama’s ambitious climate protection goals. Envisaged is an annual production rate of 1.5 million tons of high-tech hot and cold steel strip. There are also plans to double this capacity later in three expansion stages.

The main initiator, the chairman and chief executive officer of Big River Steel, is John D. Correnti, known in the USA as a pioneer in the future-oriented steel industry. Due to its credentials as a systems supplier, the SMS group, headquartered in Düsseldorf, Germany, received the order for the supply of all production lines including electrical and automation systems, coil logistics, technical assurance of installation, and commissioning. Big River Steel is planning to start steel production on the Mississippi in the first half of 2016.

Targeting sustainable steel production

Experts at the International Energy Agency (IEA) expect the global consumption of electricity to double by 2030. This is the same period covered by President Obama’s climate protection initiative, which aims for a 30% cut in US emissions of CO₂, fine dust, nitrogen oxides, and sulfur dioxides by 2030. President Obama’s regulations apply to electricity utilities as well as coal-powered steelworks, new efficiency standards for cars and trucks, and improved energy efficiency of household appliances. So now is the ideal time to launch construction of an innovative steelmaking plant to be completed by SMS Siemag AG, one of the world’s leading manufacturers of metallurgical and steel mill technology facilities. Big River Steel fully responds to the spirit of the President’s climate requirements with a particularly clean, energy-efficient steel production from regionally-sourced steel scrap.

Additionally important, the range of quality grades produced here will be geared towards the higher performance demands of challenging, fast-growing niche markets. Specifically, alongside standard steel grades for construction and white goods, there will be a focus on high-strength, multiphase steels for structural automotive parts. This industry requires ever more lightweight, consumption-optimized, yet high-strength materials.

New in the USA is a burgeoning e-mobility trend that is driving demand for small, safe, and weight-optimized vehicles. However, according to Mark Bula, chief commercial officer of Big River Steel, the company also targets new branches of industry that can offer crucial market advantages through the material properties of these high-performance steels. Also ranking high...
on the product list will be high-quality pipe grades up to X70 required for pipelines in oil and gas transportation. With an aim to advance the mill to also make X80 products.

The third key product group is electrical steels – enjoying a fast growing demand. Increasing energy consumption in America requires ever better networks with correspondingly more powerful generators and transformers. These must adequately cope with grid fluctuations caused by irregular feed-ins of renewables as well as cyclical consumption. It’s a tendency not restricted to the American market. That’s why John D. Correnti sees excellent global market opportunities for grain-oriented and non-grain-oriented steels – not just on US markets, but internationally as well. Therefore, unlike other steelworks in the region, Big River Steel is specifically designed with technology capable of the complicated production of these types of silicon strip. However,
as John D. Correnti emphasizes, Big River Steel is also planning “to produce steels in gauges and widths previously not yet available from flat steelworks.” Due to its longer CSP® tunnel furnace and so-called RH-Top degassing plant (Ruhrstahl-Heraeus process), Big River Steel is also equipped for the cost-effective manufacture of a broad range of high-quality, high-strength advanced high-strength steels, API pipe grades, and silicon steels. As of today, only fully integrated steel works are able to produce these steels.

## Trust that has grown over decades

Seeking the best contractor for the innovative design and implementation of this flat-strip steelworks, John D. Correnti chose the SMS group because – regularly over the last 30 years and more – the two partners have jointly set new standards in steel production. That was demonstrated, for example, when Correnti, then a senior manager at Nucor, was instrumental in the very first implementation of the compact strip production (CSP®) thin slab technology developed by SMS. Then a revolution in the industry, now globally established, this process involves casting the liquid steel into near-net-shape thin slabs and combining the caster with the rolling mill via a tunnel furnace. Now, in the first project undertaken by Correnti on his own account, the Düsseldorf systems supplier was the natural choice to provide process management and plant engineering. All this explains why SMS was John D. Correnti’s first choice as a partner to develop Big River Steel. Not only responsible for the metallurgical plants and rolling mills as well as all the process lines including batch annealing furnaces, the plant constructor is also supplying the entire electrical and automation systems as well as the coil logistics. All components will be tested and commissioned on the basis of the proven SMS plug & work method. Actively involved in the specification and layout of the new steelworks was the Düsseldorf consulting company MET/Con who supported the SMS group. Big River Steel is the third-largest order in SMS group’s corporate history.

## Plant flexibility a hallmark

Core elements of the future-oriented steelworks are a DC electric arc furnace, a ladle furnace, an RH-Top plant for secondary metallurgy, a single-strand CSP® plant, a coupled pickling line/tandem cold mill and a hot-dip galvanizing line. Once charged into the electric arc furnace, the scrap metal is melted to form a thermally and metallurgically homogeneous steel bath. Next in line is secondary steel production – controlling the chemical composition and temperature of the liquid steel and slag – which takes place in a double-ladle furnace. The key secondary metallurgy aggregate for high-quality steel production at Big River Steel is the RH-Top degassing plant to be supplied by SMS Mevac. This is where the carbon contained in the steel is reduced rapidly and to the maximum extent under vacuum. Simultaneously, it removes unwanted, dissolved gases such as hydrogen or nitrogen. A sophisticated process with a rapid-change system including pre-heating and vessel repair stand as well as a dedicated crane guarantees the required high productivity. Downstream of this, the steel goes through an integrated process to emerge as high-quality hot strip. Here again, John D. Correnti relies on the CSP® technology that has proved its worth over decades and that SMS is continually improving. A single-strand CSP® plant has a designed capacity to produce 1.5 million tons of hot rolled coils per year. Later to be supplemented by a second casting strand the capacity can be extended to 3.0 million tons per year. Worth mentioning, the plant casts and subsequently rolls the widest thin slabs to date, measuring 1,930 millimeters wide. Producing this new material dimension means the company meets the special requirements of ERW tubes. New at Big River Steel is an SMS-developed roller-hearth furnace, in which the slabs produced in two casters of the CSP® plant are transported via a parallel carriage to the mill stand. It enables Big River Steel to fully utilize the high rolling capacity of the six-stand CVC® plus mill.
**Variable product range for demanding markets**

Some one third of the products manufactured on the CSP® plant in the new flat steelworks progresses after rolling through a continuous pickling line with a turbulence pickling section. There, the material is descaled and oiled ahead of sale as hot strip in various qualities. The remaining two-thirds proceed directly from the pickling section to a tandem cold rolling mill. Roughly 900,000 tons of the pickled hot strip are rolled on the five-stand tandem mill. Then half of this rolled cold strip travels into a continuous hot-dip galvanizing line, designed to also operate as an anneal-only line, while the other half goes into the batch annealing furnaces. Big River Steel is the only minimill in the USA that boasts technology for such a wide range of cold rolled and finished products, giving it the capability to produce both semi-finished non-grain-oriented grades as well as the entire spectrum of laminated motor steels. In the CAL®/CGL® universal annealing and galvanizing line, cold strip is annealed, galvanized, rapidly cooled, and skin pass rolled. The line produces commercial grade hot-dip galvanized cold strip as well as high-strength, multiphase steels used above all for structural components in the automotive industry. The other half of the rolled cold strip proceeds through a discontinuous route with a batch annealing furnace and offline skin pass mill, emerging as carbon steel or high-quality electric steel. Essential for this first step is recrystallization in the batch annealing furnace to restore the strip’s ductility. Compared to most cold rolling mills, the offline skin pass mill applies much higher rolling forces to re-roll the slightly siliconized material. These NGO grades are used for rotating motor parts in the electronics industry. This complex plant layout makes it possible to manufacture a very broad range of materials for highly demanding and sophisticated applications.

**Holistic planning for sustainable success**

To meet the high environmental requirements that apply here, Big River Steel relies on state-of-the-art filter and water treatment systems in all its plants. This means, for instance, that the dusts in the gas purifier are collected and filtered. Byproducts such as zinc dusts are recycled in special reduction processes that recover valuable raw materials. Then there is a NOx treatment in the universal annealing and hot-dip galvanizing line that also helps reduce emissions to such an extent that the steelworks will be one of the cleanest in the USA. Furthermore, the electrical and automation systems for all plants and lines at Big River Steel are controlled in a process-spanning way by the X-Pact® solution from SMS. Included here is everything from drive control and sensors (Level 0) to integrated production planning (Level 3), plus all technological controls and process models (Level 1 and Level 2). Whether secure power supply for the steelworks, fully automated logistics systems, process monitoring and control from casting to cold rolling – every aspect of the plant provides optimum productivity and product quality. All components – the plants themselves as well as control
circuits, process models, and controls – will be set up and tested in advance and in real time with the SMS-developed plug & work process. That ensures fault-free workflows and perfect operability. Invaluable here is the perfect opportunity to train the staff of Big River Steel under real-life conditions. Out of this comes significantly shorter commissioning times for all units, plus fast achievement of full production levels. Despite the vast dimensions, it’s business as usual for SMS: correspondingly, Big River Steel and SMS are optimistic about the rapid progress of the new steelworks construction project.

1.5 million t of coil shall be produced annually starting in 2016