

Improving fuel security

Germany-based Gebr Pfeiffer has successfully completed an EPC turnkey project to build a complete solution for fuel conversion and coal/petcoke grinding in the existing plant of Building Materials Industries Co (BMIC) in Assiut, upper Egypt. The new grinding facility enables BMIC to improve its fuel security in today's volatile markets.

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With today's fluctuating energy markets, and increasing global geopolitical risks, it is essential for energy-intensive industries such as the cement sector to have absolute fuel flexibility. The freedom and ability to run the production line on fuels such as heavy fuel, natural gas, coal, petcoke or every imaginable mix in between, instantly and effortlessly, is key to ensuring fuel security.

While the growing demand for cost-efficient and reliable fuels are pushing investments in different industries towards further optimising operating expenditure, Germany-based Gebr Pfeiffer offers flexible and tailored solutions that meet different market challenges, by helping clients select and optimise the most economical fuel, and rapidly adapting and reducing their operation and production costs.

Improving fuel security at BMIC, Egypt

To improve fuel security at its cement plant in Assiut, Egypt, Building Materials Industries Co (BMIC) enlisted the expertise of Gebr Pfeiffer to implement a fuel conversion project that would enable

Figure 1: the grinding area at BMIC's Assiut plant includes an MPS 2800 BK VRM and process filter with flow volume of 160,000m³/h

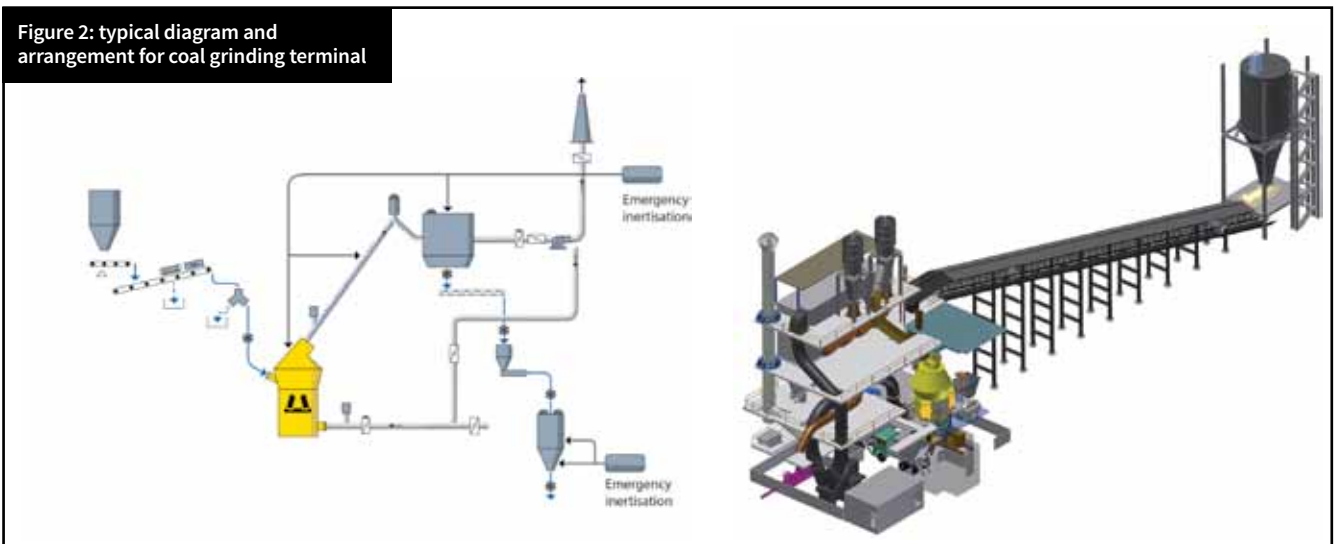


the production line to switch to coal and petcoke when required. The contract included Gebr Pfeiffer's benchmark vertical roller mill (VRM) – the MPS 2800 BK, with an installed drive power of 750kW. The mill grinds coal and petcoke with rates of 50tph and 25tph, respectively, delivering fuel to the newly-installed multi-channel burner with a coal flow rate of 13,300kg/h or

petcoke flow rate of 10,000kg/h to sustain the 5400tpd kiln.

In line with the requirements of the client, Gebr Pfeiffer, with its international and local suppliers and contractors, was able to deliver the most modern, cost-efficient and high-performance fuel conversion system. In addition, the plant was designed and built according

Figure 2: typical diagram and arrangement for coal grinding terminal



to the EU's ATEX directive and highest international standards.

Process description

The metered and metal-free grinding material is transported to two 150tph raw material silos, from where it is supplied to the mill and fed by the infeed rotary lock. In the mill the material is ground, dried and classified all at once with the MPS 2800 BK operating on three stationary grinding rollers with a rotating grinding bowl.

The process gases taken into the mill carry the ground material to the integrated classifier. The required target fineness is set by adjusting the classifier accordingly. Coal/petcoke is dried by hot gases taken into the mill. The temperatures in the grinding circuit are reduced by water injected into the grinding zone.

The finished product leaving the classifier with the gas flow is separated out in the downstream filter, where it is reclaimed by a filter screw conveyor and rotary lock.

The dust collection system is followed by the process fan. The various operating conditions of the grinding plant are considered for rating the gas volume and pressure to be produced. Downstream of the process fan, the gas flow is divided, with part of the gas flow being returned to the mill and the remainder directed to the exhaust gas chimney.

The fine coal/petcoke dust is pneumatically conveyed to two fine coal bins which are equipped with pressure relief equipment. From these two bins the fine dust enters the dosing system and is blown to the kiln burner and to the calciner and NO_x burners.

Kiln exhaust gases were sufficient for the grinding process and therefore, an additional hot gas generator was not required.

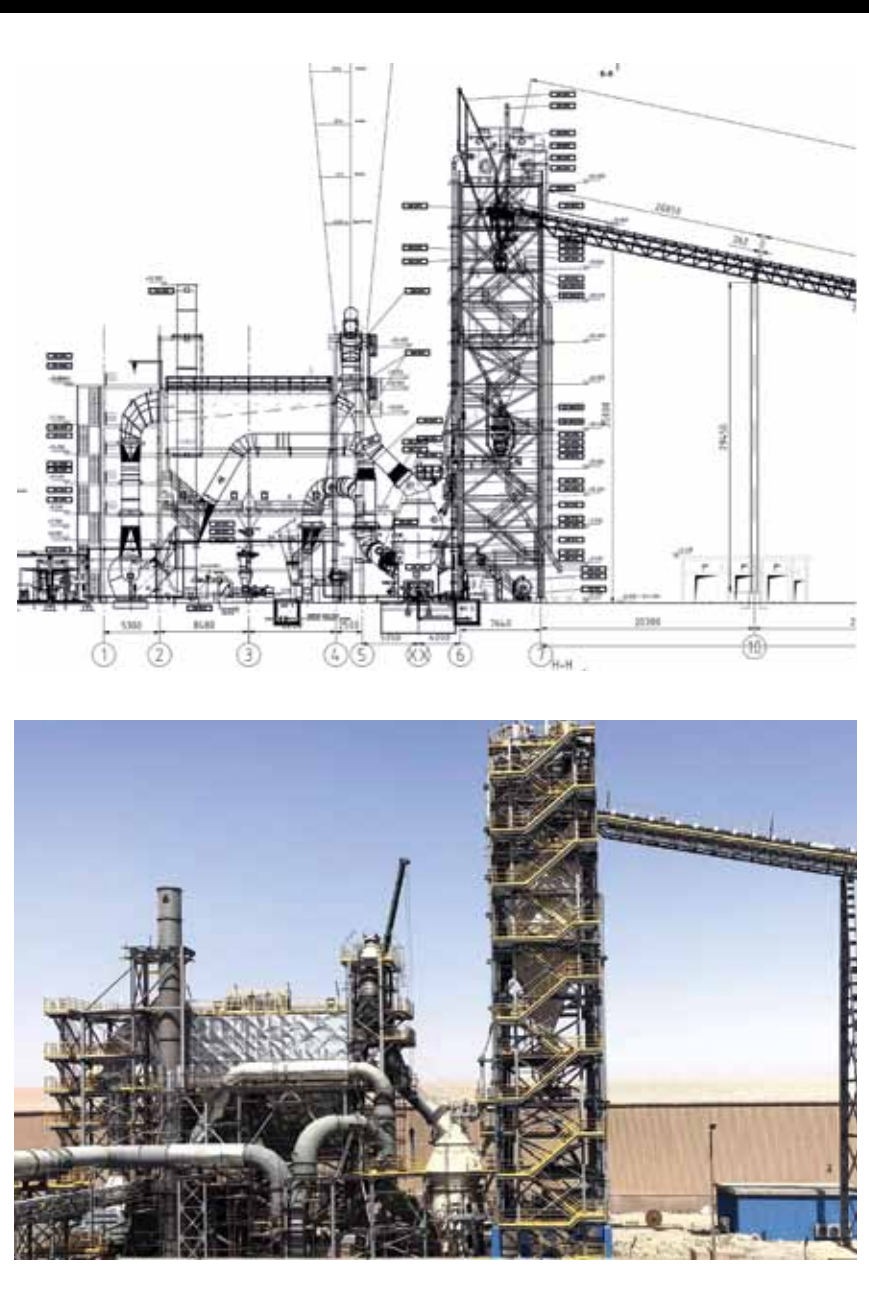
Conversion project planning and design

During the planning phase, the project was broken-down to several construction units

1. raw material intake and transport
2. grinding area: including feeding building, mill and filter
3. hot gas duct and pneumatic transport
4. fine coal silos and dosing units
5. electrical room
6. utilities
7. burners: kiln, calciner and offline NO_x burner.

The scope of the project is outlined in the box story on the right. It includes

Figure 3: grinding area and construction



Project scope

Engineering

- process engineering
- layout and mechanical design
- electrical and automation
- civil engineering and steel structure design

Procurement

- international and local manufacturing and delivery
- inspection and quality assurance
- expediting and logistics

Construction

- civil and steel structure
- mechanical erection and E&I installation
- utilities

Commissioning

- cold runs and hot commissioning
- process stabilisation
- testing, training and plant hand-over

Figure 4: complete preassembled process filter bottom hopper



Figure 5: delivering preassembled 200m³ raw coal silos



engineering, procurement, construction and commissioning of the system.

Optimising imported and local deliveries

As the main EPC contractor, Gebr Pfeiffer was able to optimise and strike a balance between the cost and time efficiency of the supply of the critical main equipment from the EU, while maximising the local manufacturing in trusted local workshops.

Increasing the local supply and services translated to shorter delivery periods and a minimum of lost time in harbours, while greatly reducing the costs of international logistics and regulatory tariffs and

customs. In addition, a critical benefit for increasing the local content was removing the burden of currency exchange risks and the demanding situations of foreign currency availability.

A further advantage was maximising the in-workshop fabrication and delivery of large volumes of preassembled equipment and structure elements with inland transport. As a result, Gebr Pfeiffer ensured the highest levels of quality control in workshops and faster erection on site.

Brownfield construction and commissioning

As with such brownfield projects, several above- and underground challenges were faced, including using space for plant construction and material storage, preparation and assembly. Unexpected underground obstacles resulted in significant risks.

The connection and tie-in with the existing plant occurred at three main points, namely the installation of a new kiln burner, calciner and NO_x burners, and the extraction of hot gases from the existing preheater system, which proved a challenge in the construction phase, due to the tight space in terms of works and crane manoeuvrability.

Accurate project planning ensured

that all connections were carried out in 10 days, within the regular plant annual maintenance shutdown.

The project team's efforts were rewarded with a smooth plant commissioning and an impressive first trial, hassle-free start-up and production.

Health and safety

Health and safety (HSE) is of the highest priority and therefore, Gebr Pfeiffer follows a zero-tolerance policy when it comes to HSE of plant operators, Gebr Pfeiffer supervisors or subcontractor teams during the implementation of its projects.

With daily briefings, raising awareness, intensive training, frequent testing and calibration of construction cranes, equipment and tools, close follow-up and more, the project site works concluded with an impressive HSE record and KPIs.

Three subcontractors executed more than 400,000h with zero fatalities, zero near-miss incidents, zero lost or restricted workdays, zero medical treatment injuries and two first aid injuries.

Economy vs safety and environmental impact

Coal is famous for being the cheapest and most abundant source of energy with global reserves expected to last decades after oil and gas are long gone. Yet it is notorious for its explosive, hazardous nature during handling and grinding, in addition to its post-combustion emissions which contains harmful gases such as CO₂, SO₂ and NO_x.

Therefore, Gebr Pfeiffer implements the highest design standards and state-of-the-art equipment for coal and petcoke grinding. The complete plant has been designed and delivered as a high-efficiency, low-emissions system and in line with the



Figure 6: installing HGD supports in between existing structures

latest ATEX directive and classifications, with up to 9bar explosion-resistant and pressure shock-proof equipment.

From the moment raw coal is delivered to the plant storage it is closely monitored

with early warning and control systems, including heat sensors, temperature level monitors and smoke detectors in addition to the firefighting network. The safety system is completed with an emergency

inerting system, consisting of a high-pressure tank operating at 60bar and filled with 10t of CO₂ ready and on stand-by.

Safety shut-off flaps and pressure relief systems are installed all through the mill, classifier and process filter, as well as O₂ and CO levels and percentages being monitored in the complete plant. The safety precautions are complemented with a vacuum cleaner that removes any coal dust traces or accumulations.

A separate offline burner ensures that NO_x emissions remain below the acceptable levels by international and local laws and regulations. Test results during actual operations returned very satisfying results. NO_x emission tests showed a NO_x level of 147mg/Nm³, well below the permissible limit of 600mg/Nm³.

Final tests and actual operation figures

Following final tests, the new fuel conversion system performed to the satisfaction of the client. Table 1 compares the guaranteed and actual production output figures of both petcoke and coal, showing that actual output and power performance exceeds contracted values.

By successfully meeting client requirements, a new success story has been added to Gebr Pfeiffer's project list, which has recently been rapidly expanding with the added references for the modular system as well as gypsum, limestone and cement grinding plants, in addition to fuel conversion projects with a complete coal and petcoke grinding terminal. ■



Figure 7: fast-track simultaneous execution

Table 1: results of grinding performance tests with guaranteed and actual data

Fuel	Contract	Actual
Petcoke		
Product output rate (tph)	25	35
Fineness (% R 90µm)	<3	2.2
Power consumption – mill drive (kWh/t)	20	8.8
Coal		
Product output rate (tph)	50	50
Fineness (% R 90µm)	<12	10.7
Power consumption – mill drive (kWh/t)	11	8.3



Figure 8: plant overview