Siemelkamp
Giesserei

Cast components for the building materials industry:

A piece of Siempelkamp in every house!

Building material suppliers play an important role for the Siempelkamp Giesserei. At the beginning of the 1980s, the foundry gained a foothold in this business segment. The start was the production of press components with a unit weight of up to 70 t for the lime sand brick industry – the status quo of which we are reporting on here!

Building materials for house building, produced with Siempelkamp cast components:

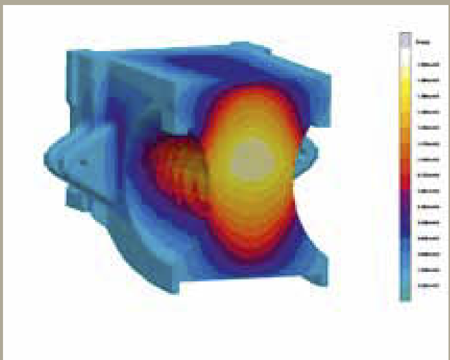
- Cement
- Lime
- Gypsum
- Raw materials for ceramics
- Raw materials for clinker
- Tiles in their final form

Enquiries are sent to the Siempelkamp raw material utilization and presses segment by customers who develop and market machines for the construction industry. In addition to mill components for the production of cement and clinker, we supply structural components for tile presses. The most prominent and most successful companies in this sector – Loesche GmbH, GEBR. PFEIFFER SE, ThyssenKrupp Polysius AG, FLSmidth Inc. and SACMI IMOLA S.C. – are for many years sustainably convinced of the competence in thick-walled cast iron "made by Siempelkamp" for the structural components of these systems. Two example projects show how successful our cooperations are.

SACMI tile press production (photo: SACMI)

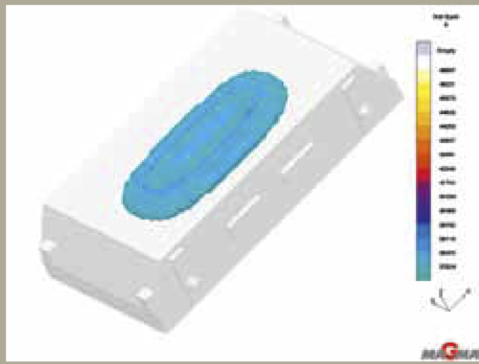
SACMI

MAGMA solification calculation of SACMI cast components



Solidification simulation of a table component

Geometrical representation cast component table



Solidification simulation intermediate piece: hot spot presentation

SACMI cross beam receives the final finish at the fettling shop

SACMI tile presses: with Siempelkamp to Imola

SACMI IMOLA S.C., an Italian tile press manufacturer, is one of our oldest customers. During peak periods, 50% of Siempelkamp's castings every year went across the Alps to Imola. This is where SACMI, a cooperative (the company belongs to the employees, who under certain conditions can acquire a share in the company) has been located since 1919, and from where it supplies tile presses, among other things, to all over the world.

New machines are being continually developed, greater and greater pressing forces can be achieved. Only recently, a ceramic tile with a length of 4,000 mm, a width of 1,800 mm and a thickness of 40 mm was pressed on a newly developed press with a pressing force of 25,000 t. The finished product looks confusingly similar to a marble slab cut from rough stone and can be used for kitchen counter tops, tiled backsplashes and floor coverings.

When one goes to a do-it-yourself store today, one sees tiles which are almost indistinguishable from natural stone or whose surface structure resembles that of wood. Then you can be almost certain that this has been produced on a SACMI tile press and therefore Siempelkamp has also been involved in its manufacture.

Brought together by tradition – a series of successes continues

Siempelkamp's skills in manufacturing thick-walled castings from ductile cast iron was brought to bear in the 1990s, when contacts were established between the two companies. It was SACMI's wish to change the structural components of the tile presses from cast steel to nodular graphite cast iron.

The changeover from cast steel to nodular graphite cast iron – one of the trends in the foundry industry of the 1980s and 1990s – provided our customer with enormous competitive advantages. The lower weight and the reduced cost of procuring the structural components for the large presses provided SACMI with clear market advantages.

The changeover was overseen by our engineering department – and a lively exchange began on all technical levels. This also filled our order books in the 1990s. Recently – in September 2012 and January 2013 – SACMI commissioned new models such as cross-beams, cylinders, stands and tables.

It all began with a tile press crossbeam with a unit weight of approximately 4.5 t. Today, there are individual piece weights of up to 42 t. A tile press such as the PH6500 series with a pressing force of 6,500 t even includes up to 130 t of iron with six components made of nodular graphite cast iron.

Production of ceramic tiles

Ceramic tiles are ceramic "plates" which are used as wall linings both indoors and outdoors, as well as for floor coverings.

Modern ceramic production uses the extrusion process and powder pressing (also called dry pressing). In the extrusion process, a plastic ceramic compound is extruded to form an endless band of single or double tiles (split clinker). This is then divided up into tiles of normal size.

In the dry pressing process, specially prepared ceramic powder is pressed in molds under high pressure and then fired. For its pressing systems, SACMI has recently made use of a comparable structure to Siempelkamp's ContiRoll®.

From left to right: Helmut Rieck and Mathias Weil, the Siempelkamp experts for cast components used in the building materials industry

Stable in every respect!

The quality is also appropriate and tested: only recently, SACMI presented the results of in-house tests of the cast iron part which had been carried out over several years with hollow drilled samples. The result: Siempelkamp supplies components with the best mechanical characteristic values – and our quality contributes towards strengthening our long-standing partnership.

Advances in casting technology are also continuing at SACMI: our Italian customer researches into materials and the stress behavior of the components. There is also a trend becoming apparent here that cast iron parts are becoming increasingly efficient, their geometry more aesthetic and their weight is being reduced. Whereas the older design had the appearance of coarse and rectangular blocks, over the course of time – and also based on our suggestions – additional functions such as oil tanks for the hydraulic pipes were added to the shapes – and other potential savings achieved. We have repeatedly been able to support SACMI with our knowledge of casting and provide stimuli for optimizing the performance of materials and their geometry.

An example: the component whose geometry has been optimized the most is a press cross beam for the latest model range. As a result of the curved design, it has above all been possible to save weight, so that the component now only weighs approximately 32 t and places the highest demands on our manufacturing technology owing to its geometric complexity. Every two to three weeks, a component of this size leaves the Siempelkamp Giesserei. Per business year, twelve to 13 cast components therefore start out on their journey across the Alps to SACMI in Imola.

"In close cooperation with the engineers from SACMI, we see our work as the continuous optimization of our components in order to continuously improve them for the customers of our client SACMI. Only recently, Matheo Cova, one of the designers at SACMI, praised the spirit of our collaboration," explains Mathias Weil, sales engineer of the Siempelkamp Giesserei.

Siempelkamp and PFEIFFER – progress based on tradition

Since the 1990s, a further cooperation has existed with the firm GEBR. PFEIFFER SE, a manufacturer of vertical mills. It all started with an interest in casting services for high individual piece weights. The trigger for the collaboration, which is still being continuously developed today, was an order 15 years ago for five 80 t grinding bowls to be supplied in quick succession for a customer in China. Here, we reliably implement a stringent schedule and supply chain, including mechanical processing.

Based on our common positive experience, it has been possible to continually expand the collaboration between PFEIFFER and Siempelkamp from 800 to 1,200 t of castings on a yearly basis. In 2012, more than 2,000 t of castings was produced from grinding bowls and plant components alone.

Today, the large bowls have a diameter of up to 6,700 mm and a weight of more than 140 t, depending on their design – a "ballpark figure" in comparison to previous dimensions. Here too, Siempelkamp Maschinen- und Anlagenbau is able to repeatedly incorporate its machining and work hand-in-hand with the foundry. The foundry supplies the grinding bowls ready for installation.

Pfeiffer has expanded its range to include MVR technology: the new MVR bowl mill crusher works with four to six roller modules, which are operated separately. MVR stands for mill, pendulum and roller, that is vertical roller mill. Maintenance or repair work can be carried out without interrupting ongoing operations. This reflects the continuing trend towards the larger and larger capacities of individual grinding systems – with major increases in the availability of the systems.

A further benefit: this technology guarantees much higher performance and better availability for the end customer. It has been possible to integrate the newly required attachment parts into the Siempelkamp portfolio.

PFEIFFER vertical roller mill
MVR 5600 C-4 for cement
(photo: GEBR. PFEIFFER SE)

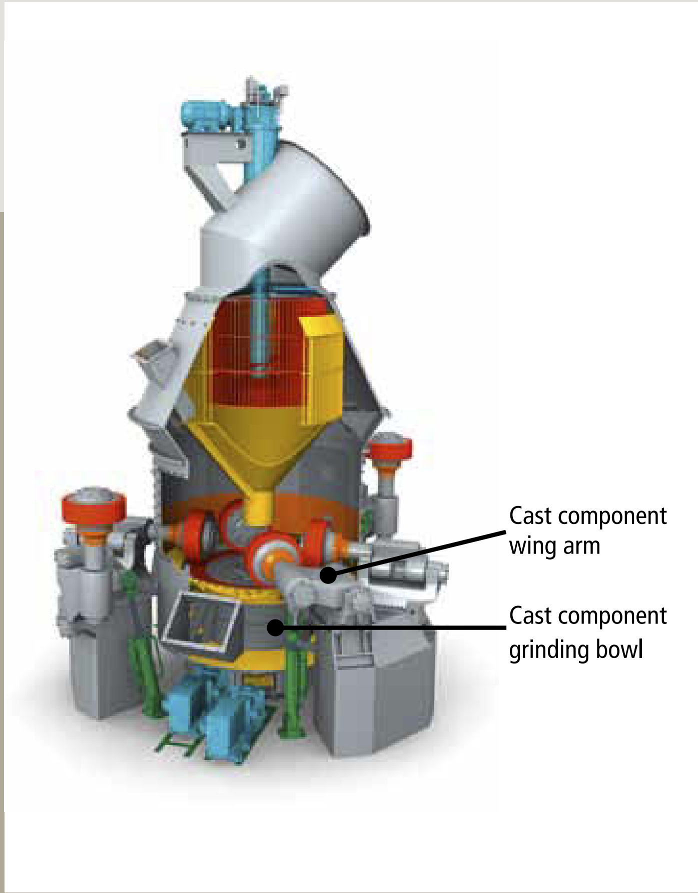


Diagram of a PFEIFFER vertical roller mill
(photo: GEBR. PFEIFFER SE)

Casting of a 160 t grinding bowl

Premiere at minus 40 °C

There have also been a number of innovations in the collaboration with PFEIFFER: "Together we have developed a flexible model standard whose application in this form has been unique over the past year. Similarly, on the basis of the intense collaboration it has been possible to define concepts for the use of cement mills at extremely low ambient temperatures of minus 40 °C," explains Helmut Rieck, long-standing sales engineer in the foundry.

To this purpose, Siempelkamp have changed the alloy for the cast component material – a première! With the development of the MVR concept, PFEIFFER have taken a giant step forward towards a significant improvement in grinding technology. For Siempelkamp, this innovation forms the basis for further successful collaboration in the future.

Loading of a PFEIFFER grinding bowl

A short lesson in building materials

Cement: A hydraulic binding material that essentially consists of compounds of calcium oxide with silica, alumina and iron oxide, which are produced by sintering or smelting. When water is added, the finely ground material produces cement paste, which hardens both in the air and in water. Advantage: strength and volume stability under water.

Concrete: Cement to which water is added, as well as sand, gravel or crushed gravel produces concrete. Concrete can be produced as pumped, fair-faced, sprayed or insulating concrete. In the case of reinforced concrete, a distinction is made between steel, glass fiber and textile reinforcement, as well as pre-stressed concrete. The reinforcement means an increase in the supporting behavior in conjunction with concrete. The Frenchman Joseph Monier is considered to be the inventor of reinforced concrete. Pre-stressed concrete has existed in theory since 1886, but was first used after many approaches and attempts for the building of bridges in 1937.

Carousel machining of a grinding bowl in the maching center of Siempelkamp Maschinen- und Anlagenbau

Cement from antiquity to the present

Antiquity: it is not possible to determine when master builders used binding agents for construction for the first time. Traces of lime mortar have been found in old structures in Turkey which are more than 14,000 years old. Corresponding binding agents which even harden under water are also found in Mesopotamia, Egypt and Phoenicia. From the period around 150 BC stem items of masonry in the Greek colonies in southern Italy in which two end wall (sound walls) are filled with a mixture of rubble, stone or mortar.

Transport of a grinding bowl to the customer

Quality inspection of the wing arm cast component for use in cement mills

Roman period: the Romans developed the old knowledge even further. They were the first to work with concrete and produce foundations, parts of buildings, water pipes and harbor walls with it. The Opus Caementitium (cement) was of high quality. A famous example is the Pantheon in Rome, which was started in 27 BC. The concrete dome has a diameter of 43 m and was only exceeded by structures with steel reinforcement such as the Centennial Hall in Breslau constructed by Max Berg in 1912, with a clear width of 65 m. The Romans fired the lime at a temperature of approximately 1000 °C.

Middle Ages: with the fall of the Roman Empire, the knowledge of "opus caementitium" was lost. In many places the dominant construction method used a timber framework filled with willow rods, straw and loam. For the few houses made of stone, lime mortar that hardened in the air was used, although this was not water-resistant and therefore not permanent.

From the middle of the 17th century the Dutch used tuff from the Eifel region to produce a mortar that hardened under water: trass. This quickly developed into a coveted trading item in other countries as well.

In the 18th century, the Englishman J. Smeaton invented Roman cement for the construction of the Eddystone Lighthouse (today Roman lime).

In the 19th century (1824), the Englishman Joseph Aspdin fired Portland cement, although the firing temperature had not yet reached the sintering point of 1450°C. Nevertheless, this material was superior to Roman cement.

It was Isaac Charles Johnson who first realized the importance of firing at high temperatures in 1844 – after which E. Langer in Germany discovered the significance of adding blast furnace slag.

In the 20th century selected mixtures of raw materials and special grindings allow the production of cement with various properties: fast or slow-setting, high-strength or sulphate-resistant mixtures. It is even possible to produce a self-compacting concrete with cement if corresponding substances are added for aeration and vibration.

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