

# Analysis – Advice – Support: Laboratory Core Competences

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The composition and quality of the raw materials, which are mostly available regionally, as well as the design of the production process directly influences the quality of a finished product. Masa GmbH does not only see their competence as an efficient machine and plant manufacturer, but also as a supporter and advisor in the design, manufacturing, and processing of products.

Over the past decades, the Masa laboratory has continued to be developed in order to cope with the increasing requests for support. Today, the company has the means to examine and evaluate concrete blocks as well as sand lime bricks and autoclaved aerated concrete products. A wealth of experience helps producers stay rest assured that quality standards are met through advisory support and analytic capacities.

## Raw material analyses

The first step in developing and manufacturing autoclaved aerated concrete and sand lime brick products is the selection of appropriate raw materials. All relevant tests of the required raw materials, such as sand, cement, and lime, can be carried out in the Masa laboratory.

## Sand

Sand is the raw material making up the highest proportion of the aforementioned products. Being one of the most important components in the manufacturing process, makes it the primary focus during examinations. Its physical and chemical properties are of particular interest.

All examinations start with a dry screening to determine the grain size distribution of the respective sample. This distribution helps to compare different sand samples.

To produce sand powder, a laboratory ball mill is used. This is a dry mill with a diameter of 500 mm and a length of 400 mm. The grinding body filling degree is 32 % at a total ball weight of 112 kg. The mill serves to determine the grindability, or the so-called BOND index. The determination of the BOND index is an important point for the selection of an appropriate ball mill and its charge make-up (ball distribution). When the sand has been milled, the specific surface (Blaine value) is determined. This value is required for the recipe calculation. The ground sand is used as raw material for the manufacturing of sample blocks.

*Masa laboratory mill*



Subsequently, the sand sample is analyzed wet-chemically. Among other findings, this includes the determination of the  $\text{SiO}_2$  content which enables a classification of the sand (regarding its suitability for the autoclaved aerated concrete production).

## Lime

To evaluate a lime sample, the reaction rate and the calcium oxide content have to be determined. The conversion of calcium oxide to calcium hydroxide by adding water runs off with a heat release of 1187 kJ per kg of calcium oxide. The reaction rate is calculated automatically by determining the wet slaking curve (according to the European regulation DIN EN 459-2). In the Masa laboratory, the calcium oxide content is determined by means of titration.

## Cement

To compare and evaluate different types of cement, the grinding fineness and the setting behavior are determined in the laboratory. The specific surface is determined according to DIN EN 196-6 and the setting behavior according to DIN EN 196-3.

In case more chemical and mineralogical analyses are necessary, these are carried out in cooperation with research associations and universities. Among other analytical techniques, X-ray fluorescence analysis (XRF) and X-ray diffraction analysis (RDA) are carried out there.

## Manufacturing laboratory-scale autoclaved aerated concrete blocks

Based on the determined raw material values, the first recipes can be calculated. The specific surface (Blaine value) is necessary to determine the required CaO content of the AAC mixture.



Mr. Björn Gorka started to work for Masa GmbH as a process engineer in 2007, and he is Masa's expert for all questions around the topics related to raw material analysis and process technology. Mr. Gorka studied civil engineering focusing on building materials and refurbishment at the Bauhaus-Universität Weimar from 1996 to 2002. Since 2007, he has been responsible for the Masa laboratory in Porta Westfalica, and he also advises and trains our customers. The Masa customers benefit from Mr.

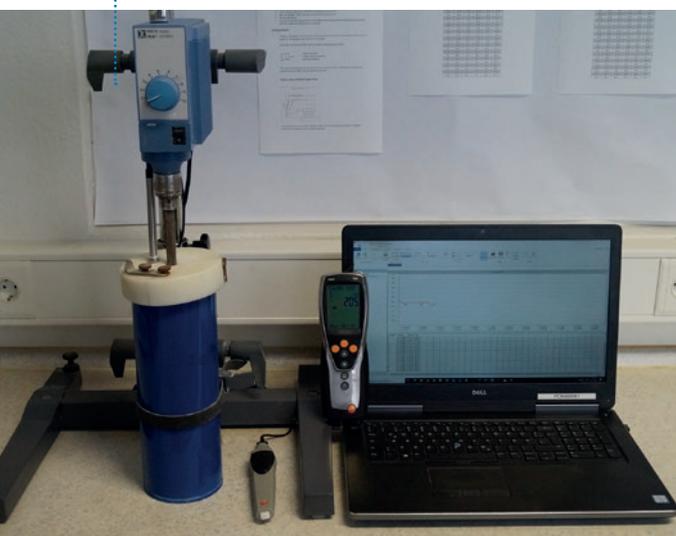
Gorka's expertise, whether for the setup of a new sand lime brick or AAC plant or for plant optimizations and troubleshooting. [B.Gorka@masa-group.com](mailto:B.Gorka@masa-group.com)

The calculated quantities of the individual raw materials are weighed and mixed in the laboratory mixer. Then, the AAC compound is cast into molds with a size of 400 x 370 x 300 mm (length x width x height). With a large casting mold it is easier to derive data that can be transferred to the original molds of an AAC block plant. After casting, the parameters 'temperature' and 'elevation' are continuously being measured and recorded. Blocks with a sufficient hardness are cut to a size of 330 x 130 x 200 mm and autoclaved.

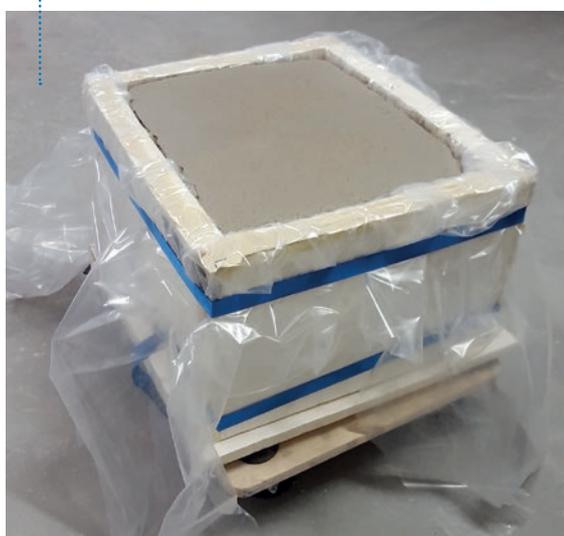
To simulate a realistic hardening process, the Masa laboratory is equipped with a lockable autoclave with a volume of 200 l. The autoclave is equipped with a liquid ring pump to generate a vacuum of -0,6 bar. Computer-controlled, the pressure can be increased up to 16 bar and maintained at that level.

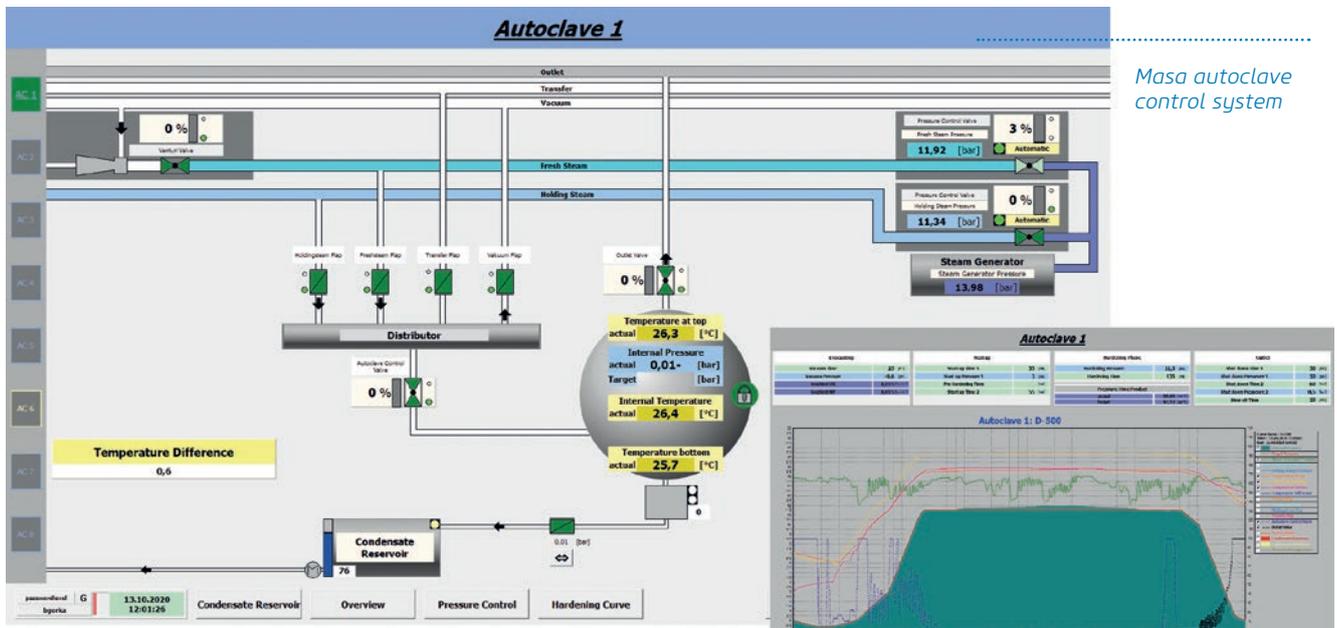
The laboratory equipment with its own controllable autoclave serves another purpose. Designed as a "little" brother to the real Masa autoclave control system, the laboratory model offers the perfect test environment for possible innovations to the autoclave control system. This helps to ensure that only technically mature versions are installed in an AAC plant.

*Determination of the wet slaking curve*



*Casting mold for sample blocks*





Masa autoclave control system

After autoclaving, the blocks are cut to cubes with an edge length of 100 mm and conditioned in a drying chamber according to DIN EN 772-1. They serve to determine the dry raw density and the compressive strength. The compressive strength test is carried out with an electronically controlled testing machine.

The results are considered for further recipe optimizations, and this helps to evaluate the raw materials

provided by the customer. Therefore, it is possible to manufacture the best possible product on the laboratory scale already.

The data determined in the Masa laboratory can easily be transferred to a large-scale plant. Thus, the raw materials can be selected during the planning period, which helps to reduce the time required to start-up the plant.

### Laboratory autoclave



### Advice, technical support and transfer of knowledge

Of course, customers can benefit from additional technical support by Masa experts when the plant has been taken into operation to generate the best possible products.

In addition, laboratory technicians and plant operators get access to the comprehensive Masa instructional material dealing with the topic "process technology". Masa can also organize seminars specifically designed to individual customers to train them in the fields of sand lime brick and AAC production.



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