

TURN KEY MANUFACTURING PLANT FOR SUDAN

AUTOCLAVED AERATED CONCRETE (AAC) BLOCK

PRELIMINARY OFFER



SEPTEMBER 2006

CONTENTS

GENERAL

SYSTEM DESIGN

PRODUCT

PRODUCT PROPERTIES

PRODUCT SPECIFICATION

PROCESS DESCRIPTION

PRODUCTION PROCESS

CAPACITY CALCULATION

KEY PROCESS EQUIPMENT

SCOPE OF OFFER

ENGINEERING AND TECHNICAL ASSISTANCE

TRAINING AND START UP

PLANT LAYOUT

UTILITIES AND SYSTEM INSTALLATION

PERSONNEL REQUIREMENTS

MANUFACTURING FEASIBILITY COST ANALYSIS

TIME SCHEDULE

CONCLUSION

Detailed Product Description:

Our autoclaved aerate concrete plant can produces 50,000 - 300,000m³ building blocks and panels.

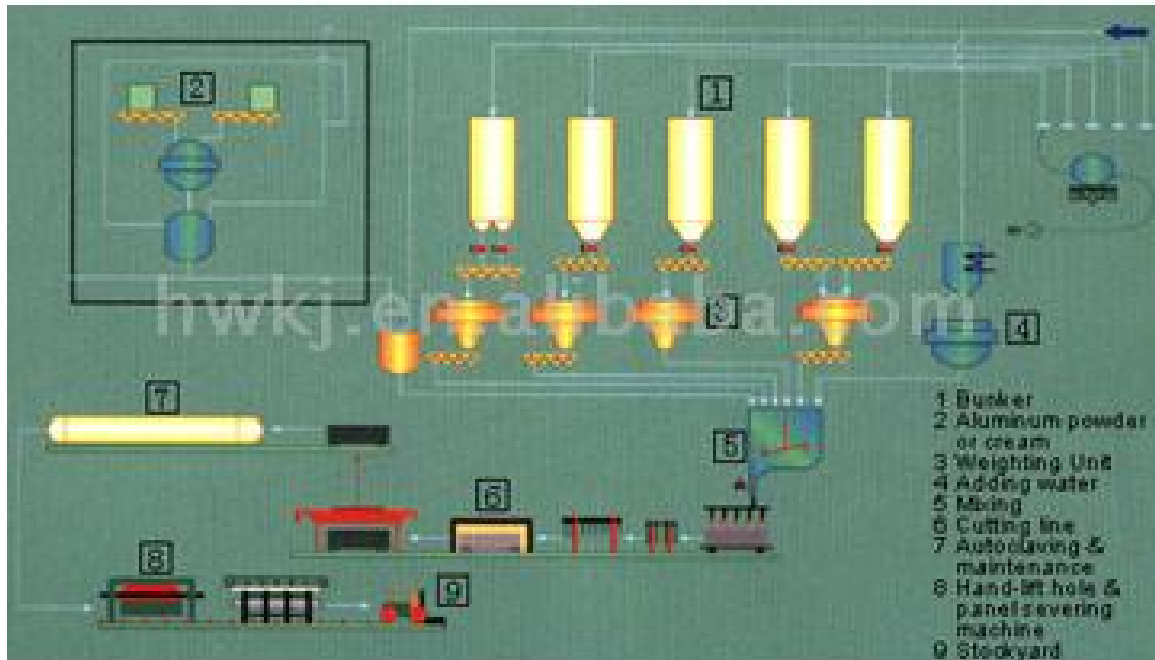
Features:

- 1) Good heat insulation and humid retention (IR=0.14)**
- 2) Nonflammable**
- 3) Volume weight: 300 - 800kg/m**
- 4) Error of overall dimension: 1.5mm**
- 5) Sound insulation value RW: up to 52dB-A**

Raw material:

- 1) Sand, or pulverized fuel ash**
- 2) Lime**
- 3) Cement**
- 4) Water**
- 5) Aluminum powder or gas former**

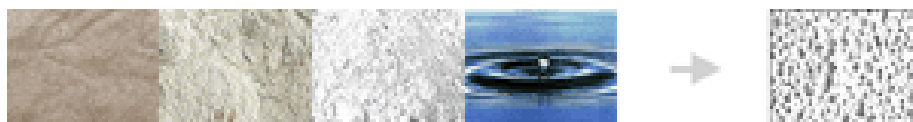
Autoclaved Aerated Concrete (AAC) products are 4 times lighter in weight than ordinary concrete



Its characteristic structure comprising millions of tiny pores, it offers optimum solidity at low weight. As air has a low heat conductivity, aerated concrete provides for excellent thermal protection. It protects from cold and heat, allowing for single-shell constructions which provide more space, save time and reduce costs-aspects which are of considerable importance to property developers

The Basic Materials:

Aerated concrete is made from natural raw materials -- sand, lime, cement and water -- with an aerating agent. The main material is quartzitic sand.



PRODUCT RANGE

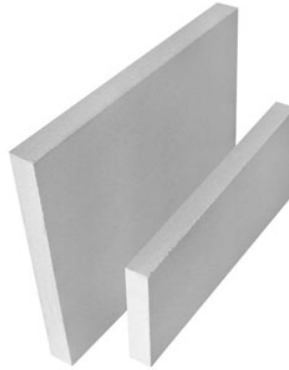
1-PLAIN END BLOCK



2-FLOOR BLOCK



3-INSULATION BLOCK



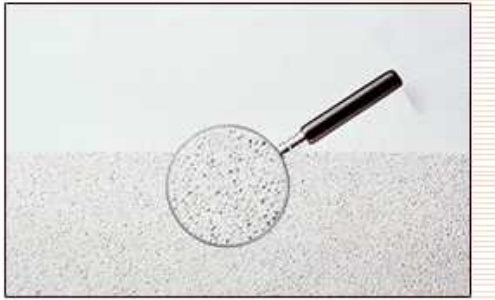
4-FINE JOINT ADHESIVE

Adhesive Requirements									
Amount of adhesive required per 1m ² blockwork									
Block thickness (cm)	10	12.5	15	17.5	20	22.5	25	27.5	30
Adhesive (kg/m ²)	1.5	1.9	2.2	2.6	2.9	3.3	3.7	4.0	4.4

PROCESS DESCRIPTION

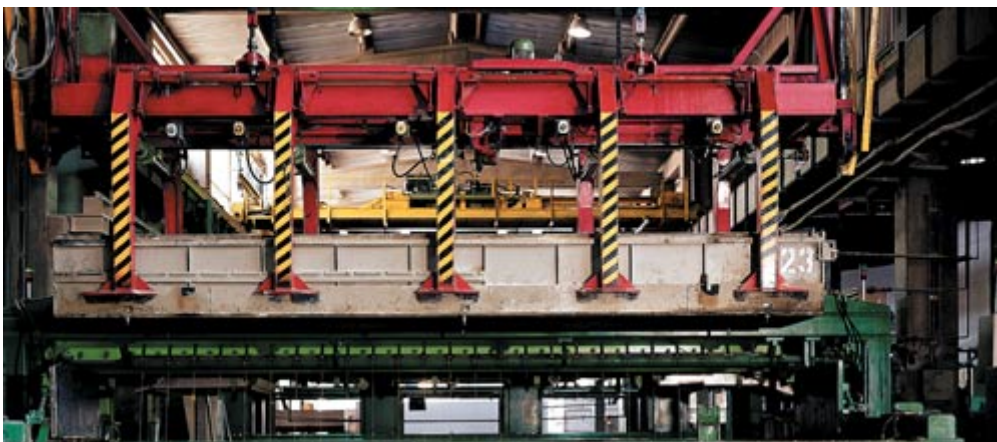
Products are classed as "lightweight concrete" materials/elements.

Their ingredients consist of pure quartz sand, Portland cement, lime, and gypsum. Ground to a fine powder, these ingredients are mixed with water and pure aluminium powder as an aerating agent and the slurry thus obtained poured into shallow casting cars.



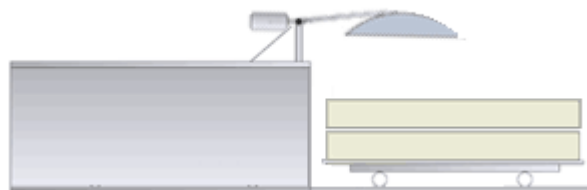
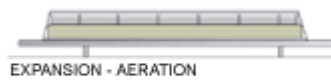
Once the pour is complete, the cars are rolled into a holding tunnel where mix temperature is continuously monitored until initial set takes place. This being attained in about 3 to 4 hours, the entire casting is moved onto the bed of a computer-controlled cutting machine where products of the required sizes are obtained with millimetric precision.

The cut casting, still intact, is then rolled into autoclaves for high-pressure steam curing, which lasts for about 12 hours under a pressure of 12 atmospheres and a temperature of 190°C. Products coming out of this steam curing stage are first subjected to stringent quality checks and only then marketed ready-to-use as the light-weight, high-strength aerated building material of reknown.

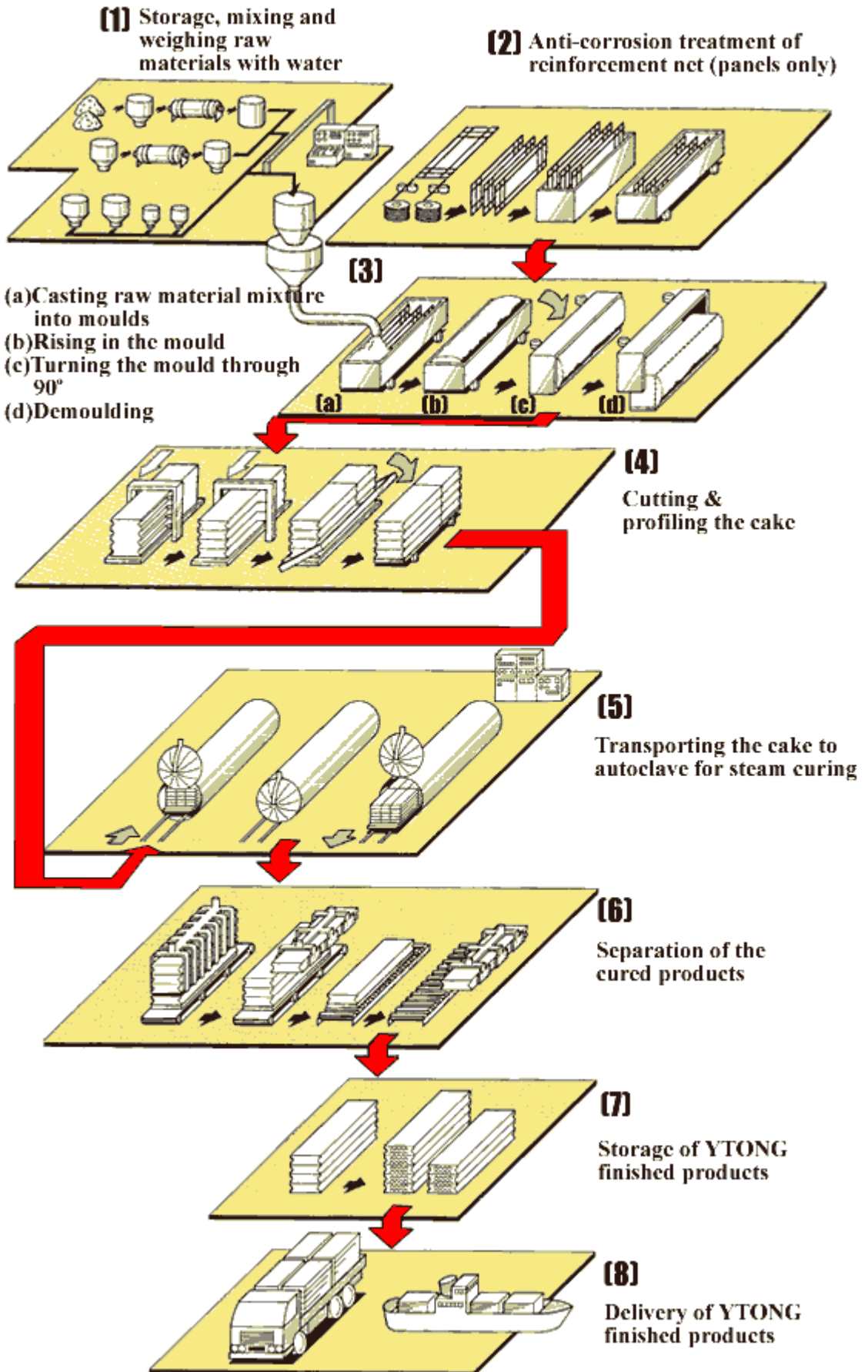


PRODUCTION PROCESS

INGREDIENTS
QUARTZ SAND PORTLAND CEMENT LIME GYPSUM



HIGH-PRESSURE STEAM CURING



PRODUCT PROPERTIES

PROVIDES INSULATION ■

Having a porous composition, AUTOCLAVED AERATED CONCRETE BLOCK provides a high order of thermal insulation. AUTOCLAVED AERATED CONCRETE BLOCK is an ideal material that offers significant economies in the initial outlay and running costs of heating or cooling buildings as well as opportunity for exploiting other potential benefits.



LIGHTWEIGHT ■

Embodying no compromises in terms of strength, by reducing overall building loads with its low dead weight, significantly improves the seismic performance and safety of buildings. It is a low-density solid masonry material with a dry specific weight ranging from 400 to 800 kg per cubic meter.



FIRE-PROOF ■

According to DIN 4102 norms, is a Class 1 fire-proof material that can withstand temperatures up to 1,200°C. With this property, it is an intelligent choice where fire safety is of prime concern. As a side benefit of this property, it is highly resistant to weathering and is therefore a very durable material.



PRECISION-MADE ■

Being manufactured to exact dimensions with very close tolerances, BLOCK provides high levels of accuracy in setting out. Its smooth faces and sharp arises allow fair-faced finishing with or without liquid coatings. By the same token, rendering, where such a finish may be desired, can be kept extremely fine.



Product Specifications

Strength Category		G2	G3	G4	Units		
Average compressive strength		25	35	50	kgf/cm ²		
Maximum gross density-dry		400	500	600	700	kg/m ³	
Modulus of elasticity		12500	17500	22500	27500	kgf/cm ²	
Thermal conductivity	Bulk material	λ_d^*	0.11	0.14	0.16	0.18	W/mK
		λ_h^*	0.14	0.16	0.19	0.21	
	Coursed wall	λ_h^*	0.15	0.17	0.20	0.23	
Design value for dead load	Coursed wall	500	600	700	800	kg/m ³	
Water vapor diffusion resistance factor(μ)		5-10					

* λ_d : Actual thermal conductivity of material under laboratory conditions.

* λ_h : Input value of thermal conductivity for heat loss/gain calculations according to TS 825 and DIN 4108.

Technical Data

Density	Shrinkage	Compressive Strength	Sound Insulation	Thermal Conductivity	Vapour Resistance
500 or 650 kg/m ³	0.05%	5.0MPa *	39dB (100 mm block wall)	0.16 W/m°C	2.16 x 10 ⁴ msN/mm ² kg

Fire Rating Performance

	<i>Fire Resistance Period (hr.)</i>				
	1	2	3	4	6
<i>Minimum Thickness for Fire Rated Partition: Partition Thickness mm</i>	50	63	75	100	150

AAC can be produced in a wide variety of products.

Typical product characteristics are:

- **Block dimensions:**

- .- block length: 600 mm +/- 1,5 mm
- .- block height: 200 and 250 mm +/- 1,0 mm
- .- block thickness: 75 – 350 mm +/- 1,0 mm

- **Panel dimensions:**

- .- panel length: 1.500 mm – 6.000 mm +/- 5,0 mm
- .- panel height: 600 mm +/- 3,0 mm
- .- panel width: 100 – 350 mm +/- 3,0 mm

.(tolerances given are those required by the EN/DIN norm)

- Density range: 350 – 700 kg/m³
- Compressive strengths: 2,5 – 7,0 N / mm²
- Thermal insulation:

R-value = 0,09 – 0,16 W/[mK],;

U-value for 200 mm block is ca. 0,52 W/m².K

- Fire rating: Non-combustible – min. 4 hours, up to 6 hours
- Sound insulation: 2 dB bonus.

Plant concepts and investment costs

We can provide you with several types of AAC production plants based on the standard plant range is designed for production capacities from 400 up to 1.500 m³/day. Depending on your requirements for capacity and the product specification we will make a recommendation on the technology to be used.

Generally an plant comprises following sections: as an integral plant concept:

- . • Raw material storage and handling;
- . • Slurry handling;
- . • Mixing and dosing;
- . • Mould systems;
- . • Cutting line;
- . • Bogey system;
- . • Autoclaving;
- . • Steam preparation;
- . • Unloading;
- . • Packaging;
- . • Reinforcement treatment and handling (if required);
- . • Reinforcement production (if required).

The estimated investment for an AAC plant for block production is indicated in the table below depending on the plant capacity. The investment estimates are exclusive of the cost for the purchase of land and the civil construction work for foundations and buildings.

Theoretical production capacity	Effective production time	Investment cost for machinery and equipment*
450 m ³ /day	22,5 hours/day	
650 m ³ /day	22,5 hours/day	
1100 m ³ /day	22,5 hours/day	
1350 m ³ /day	22,5 hours/day	
1.500 m ³ /day	22,5 hours/day	

Project planning

Generally we recognize the following stages in the development of a new AAC plant project:

- . • Market analysis (product demand, sales prices of AAC, AAC plants in region, etc.);
- . • Availability of raw materials (suppliers, delivery frequency, quality, prices);
- . • Machinery (suppliers, prices, type of machinery required, automation grade needed);
- . • Governmental policies & restrictions (building, land, machinery, product requirements);
- . • Land (size, availability, paving, testing, etc.);
- . • Building (suppliers, etc.);
- . • Total financial analysis (estimated turnover, return-of-investment, etc.)

Furthermore we are able to assist you in the following above-mentioned stages:

- . • We are able to support you with an economical feasibility study to estimate your specific return-on-investment (ROI), expected turnover, learning curve, etc. in your situation. If you wish we can send you a template file with the required input parameters for the model, like interest rates, electricity costs, etc. Subsequently we will process the data, with which you will receive a detailed economical feasibility report. We prefer to continue with this feasibility tool if our budget quotation is in your line of expectation.
- . • Overall consultancy on the machinery and civil works.