TURN KEY MANUFACTURING PLANT FOR SUDAN

AUTOCLAVED AERATED CONCRETE (AAC) BLOCK

PRELIMINARY OFFER

SEPTEMBER 2006

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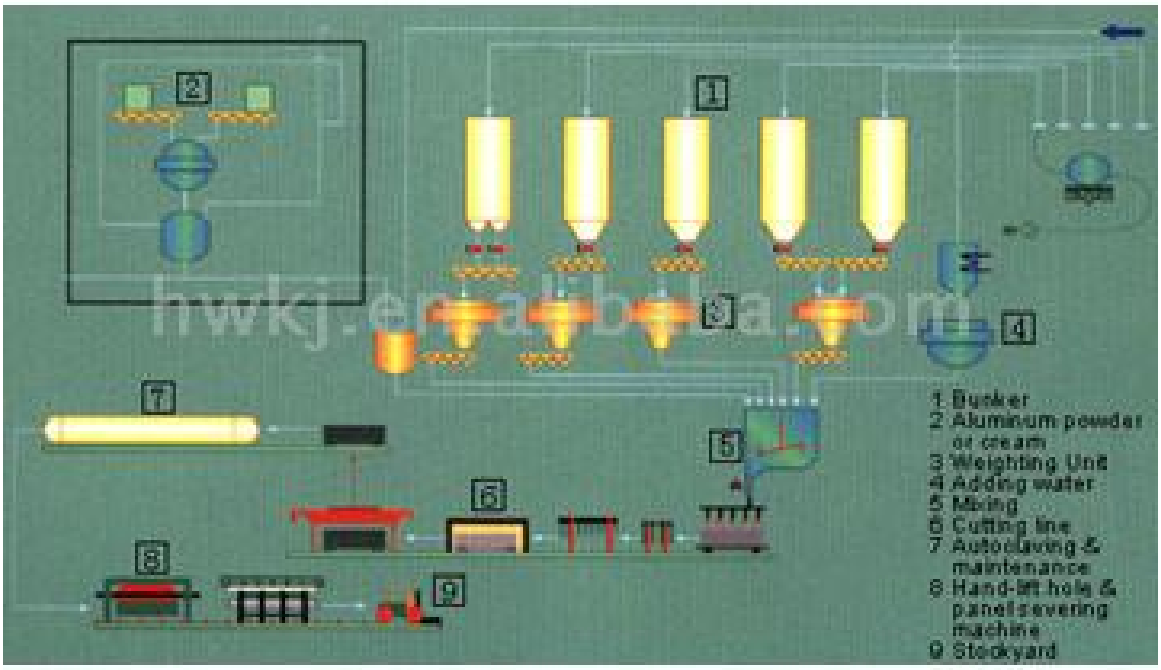
Detailed Product Description:

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

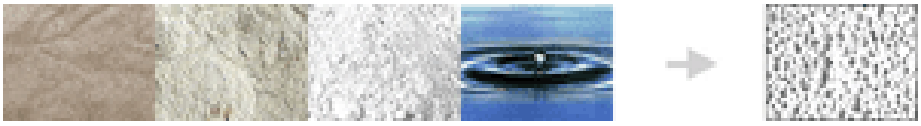
Autoclaved Aerated Concrete (AAC) products are 4 times lighter in weight than ordinary concrete



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.

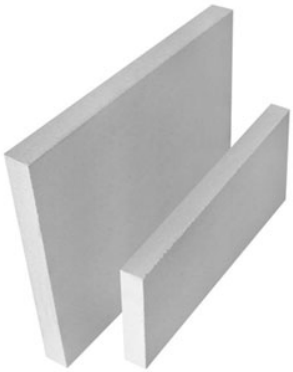


PRODUCT RANGE

1-PLAIN END BLOCK

2-FLOOR BLOCK

3-INSULATION BLOCK



4-FINE JOINT ADHESIVE

Adhesive Requirements

Amount of adhesive required per 1m² blockwork

Block thickness (cm)	10	12.5	15	17.5	20	22.5	25	27.5	30
Adhesive (kg/m²)	1.5	1.9	2.2	2.6	2.9	3.3	3.7	4.0	4.4

PROCESS DESCRIPTION

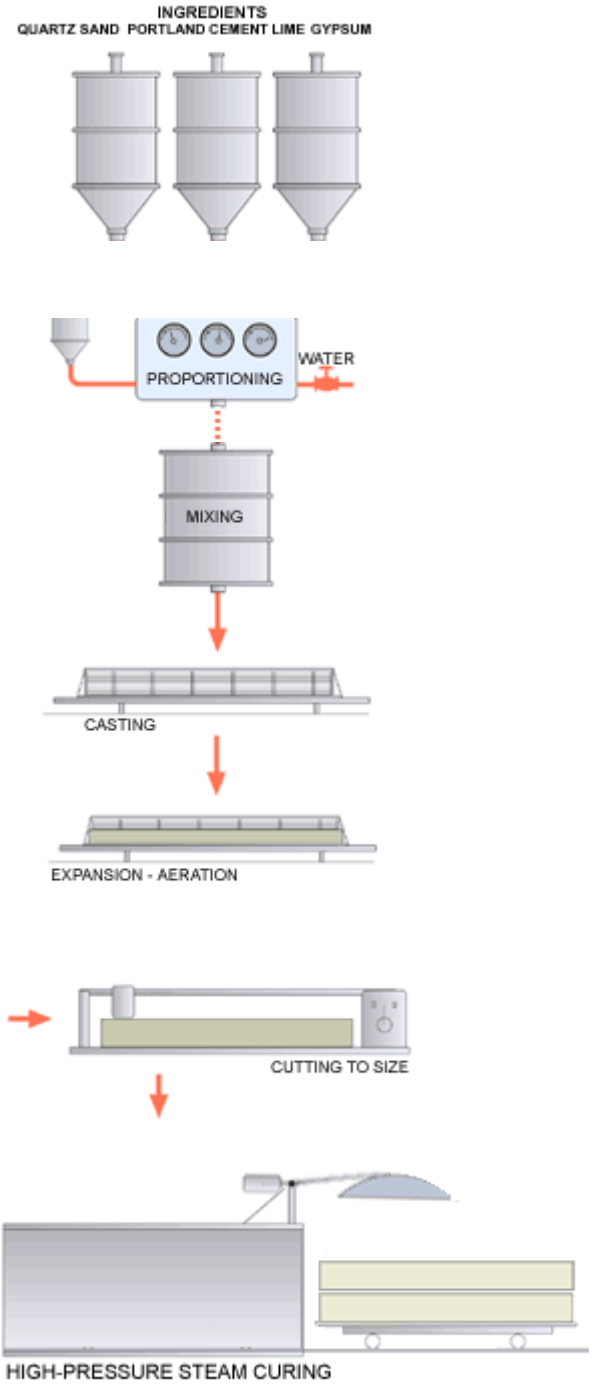
Products are classed as "lightweight concrete" materials/elements.

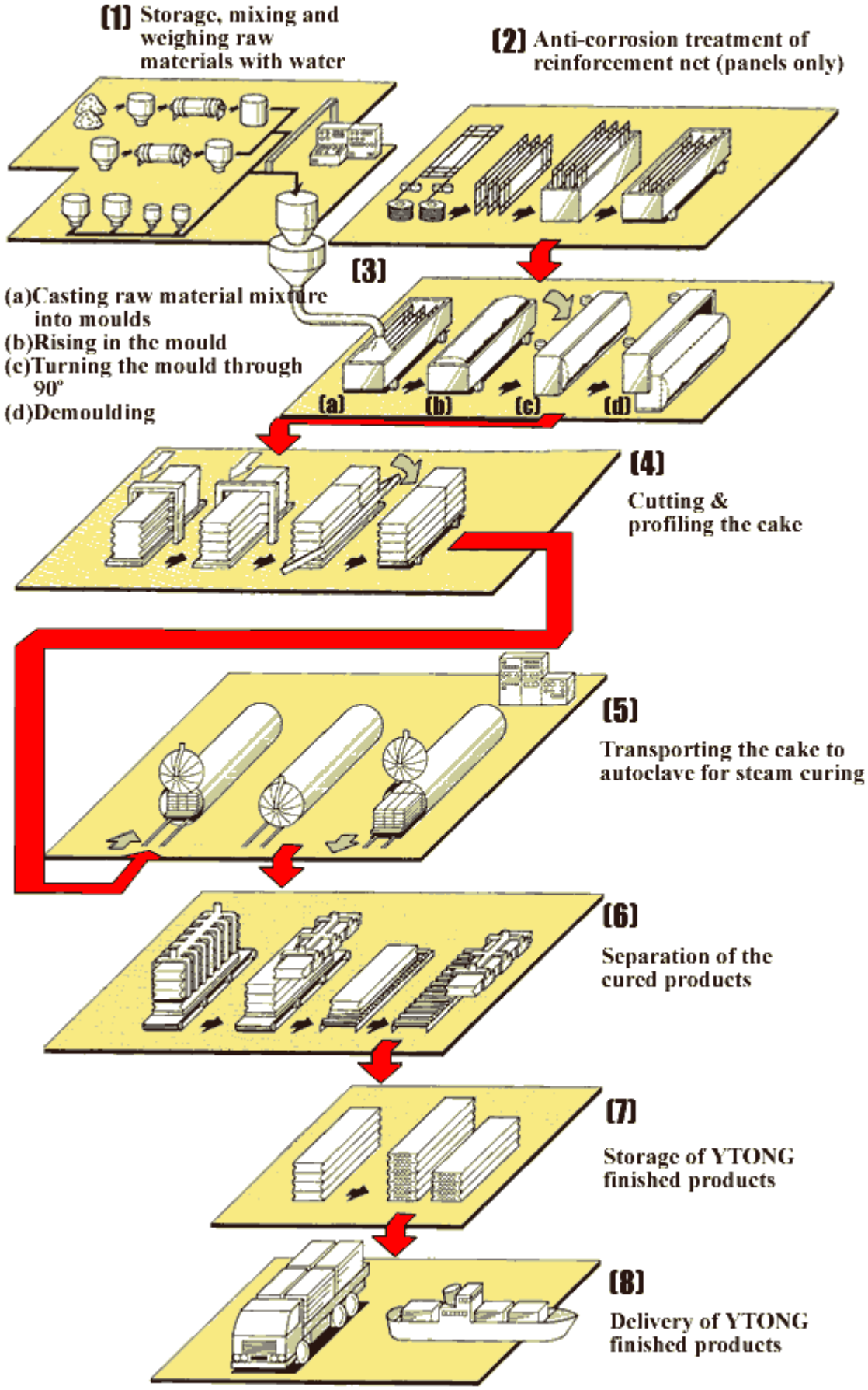
Their ingredients consist of pure quartz sand, Portland cement, lime, and gypsum. Ground to a fine powder, these ingredients are mixed with water and pure aluminium powder as an aerating agent and the slurry thus obtained poured into shallow casting cars.

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-strengthaerated building material of reknown.

PRODUCTION PROCESS




(1) Storage, mixing and weighing raw materials with water
(2) Anti-corrosion treatment of reinforcement net (panels only)
(3)
(a)Casting raw material mixture into moulds
(b)Rising in the mould
(c)Turning the mould through 90°
(d)Demoulding
(a)
(b)
(c)
(d)
(4)
Cutting & profiling the cake
(5)
Transporting the cake to autoclave for steam curing
(6)
Separation of the cured products
(7)
Storage of YTONG finished products
(8)
Delivery of YTONG finished products

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, İs 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/cm²
Maximum gross density-dry			400	500	600	700	kg/m³
Modulus of elasticity			12500	17500	22500	27500	kgf/cm²
Thermal conductivity	Bulk material	λd*	0.11	0.14	0.16	0.18	W/mK
		λh*	0.14	0.16	0.19	0.21	
	Coursed wall	λh*	0.15	0.17	0.20	0.23	
Design value for dead load	Coursed wall		500	600	700	800	kg/m³
Water vapor diffusion resistance factor(μ)			5-10				

*λd: Actual thermal conductivity of material under laboratory conditions.
*λh: 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^oC	2.16 x 10^4 msN/mm^2 kg

Fire Rating Performance

	Fire Resistance Period (hr.)				
	1	2	3	4	6
Minimum Thickness for Fire Rated Partition: Partition Thickness mm	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/m^3**
. • **Compressive strengths: 2,5 – 7,0 N / mm^2**
. • **Thermal insulation:**

R-value = 0,09 – 0,16 W/[mK],;

U-value for 200 mm block is ca. 0,52 $W/m^2.K$

. • **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 m³/day	22,5 hours/day	
650 m³/day	22,5 hours/day	
1100 m³/day	22,5 hours/day	
1350 m³/day	22,5 hours/day	
1.500 m³/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.**