

INDIAN
Ceramics
12th Annual Ceramic Materials, Machinery,
Supplies & Technology Show **2017**



MARCH 1 - 3, 2017
Gujarat University Exhibition
Centre, Ahmedabad

MECHANIZATION OF INDIAN CLAY BRICK FACTORIES



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market trend of indian brick production

India is the world's largest developing country with economic growth rate averaging 8% for the last 5 years.

The brick production is increasing by 5-10% annually due to emergence of various developmental sectors, mainly housing, urbanization and infrastructure.

India is estimated to have more than 1,45,000 registered/unregistered brick kilns producing more than 236 billion bricks. It is second largest producers of the brick in the world after China.



widespread brick production system in
India



the heavy clay industry situation in India.

We read from the internet the following:

“Central Pollution Control Board (CPCB) indicated the brick production as apolluting industry due to prevalence of obsolete production technologies, invading also top soil or land which could be used for agriculture...”



Brick industry workers condition

CPCB confirmed also:

The workers in the brick industry are subjected to bad working conditions due to:

- *Exposition to high concentrations of Respirable Suspended Particulate Matter (RSPM), ..., as the kiln chamber is covered with ash.*
- *Transportation of green and red bricks done by a load of 9 to 12 kg causing health problems, especially in women.*
- *seasonal nature of brick production generating employment for a limited period of six - seven months in a year.*

There is large migration towards the major brick production clusters every season due to this.

The last few years have seen a labor shortage as the new generation does not want to be associated with the brick sector any longer”.



Manual treatment of row material



Manual forming and natural drying bricks



loading bricks for clamp kiln



bricks unloading after firing in a clamp kiln



Bricks loading in an open flath arch Hoffmann kiln



Solid fuel for open flat arch Hoffmann kiln



Fired bricks unloading



Indian roads situation

We read by internet also:

" ... outside major cities, roads are often poorly maintained and congested. India has a total of about 2 million kilometers of roads out of which 960,000 kilometers are surfaced roads and about 1 million kilometers of roads in India are poorly constructed ones.



final summary

Apart from a few important modern realizations, we are dealing with archaic seasonal production systems:

- ✓ Difficult working conditions,
- ✓ messy use of large extensions of land,
- ✓ high specific energy consumption,
- ✓ considerable final waste,
- ✓ Limited range of final products,
- ✓ air pollution.
- ✓ Many badly ride quality roads



basic premises

I was informed about these basic premises we could find:

- ✓ fired weight of a standard brick: 3.0 ~3.2 kg appx
- ✓ price of a standard indian brick with transportation: 3.50 ~ 4.5 INR
- ✓ that means...17,5 ~ 22,0 €/ton (1.250 ~ 1.571 INR/ton)
- ✓ clamp kiln factories existing in India : ~ 100,000
- ✓ Hoffman kiln factories existing in India: ~ 25.000

So it should not be overlooked the low selling price of the bricks.



should we suggest the spread of a fully automated brick plants?

The very important question is: in how much time are the investors willing to amortize a new very automated installation ...? Five years?

In that case the total investment of 15 millions Euro (INR 1.070.000.000) (provided they are enough) for a new fully automated installation should be recovered with 3 millions Euro/year (INR 214.000.000)! Is it possible?

Perhaps!....If a plant can produce at least 150,000 tons/year and if it is possible selling the product at 40 €/ton (2.857 INR/ton), against the current selling price we saw before).

It could be possible if selling at the same weight products having more than double volume. And provided the market accepts them!

As far as I know per experience, it will take time to change the habits and the building methods.

These are the numbers and the situations, it is necessary to cope with.



which way then?

There are three directions that the heavy clay brick indian industry could follow:

- Stiff extrusion technology (Great Britain, U.S.A., Australia, South Africa, Malaysia).
- Soft mud technology.
- Standard extrusion technology (all Europe and rest of the world)

So, which one? Maybe the three!

I would like to speak in this presentation about the standard extrusion technology.

However, I believe that also the other two technologies can find a very good development, specially for production of facing bricks.



which kind of heavy clay bricks elements for next future?

It will be possible to switch gradually:

- from solid bricks to perforated bricks
- from perforated bricks to double bricks .
- From double bricks to small dimension hollow blocks.

All that, easy to produce, to transport, to unload from trucks ...and easy to handle.

Finally, in the future:

- From small dimension hollow blocks to big dimension hollow blocks (cm. 20x20x40, kg 12,5)



hand made standard solid brick





extruded standard solid brick



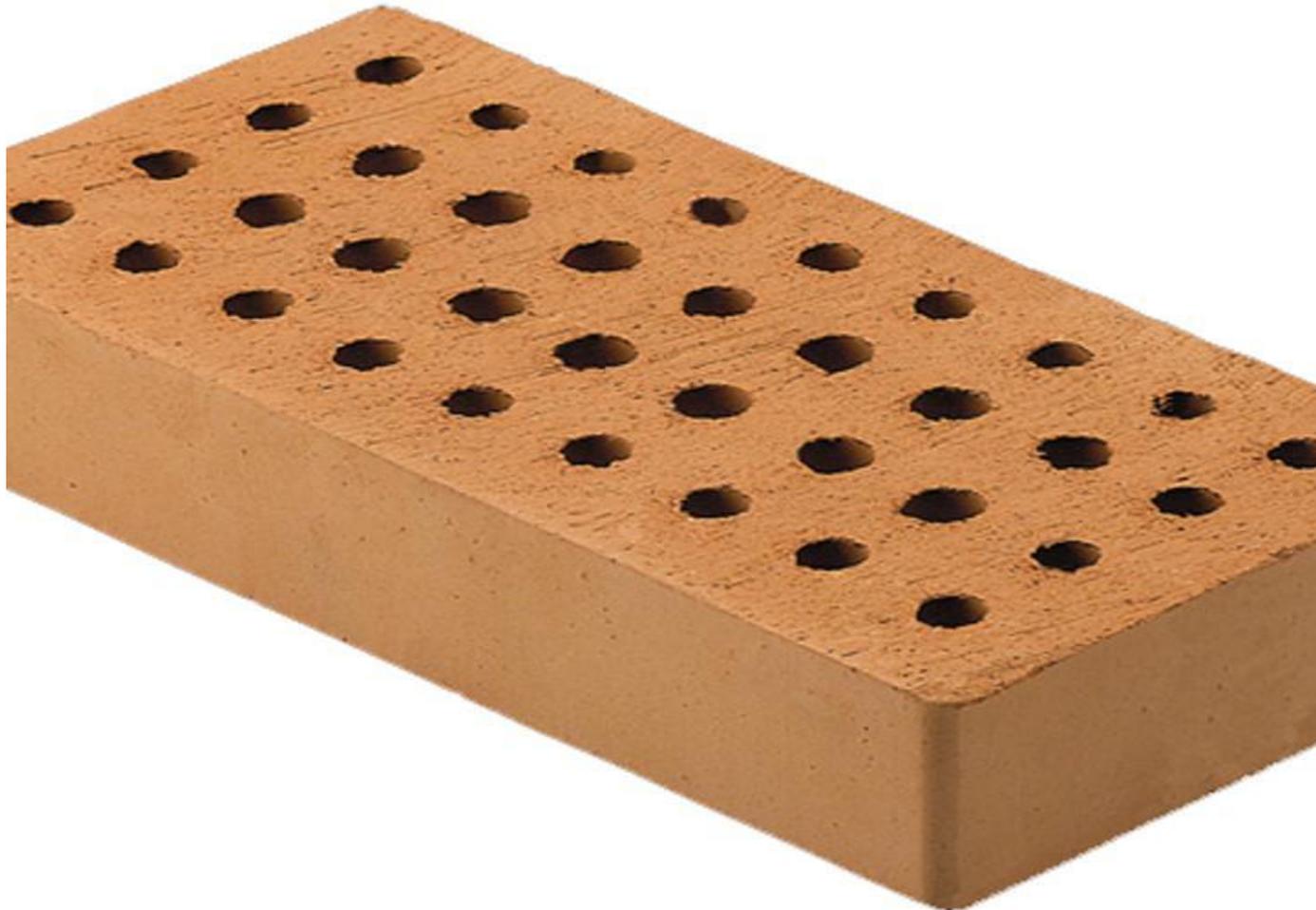


Hand made bricks and extruded bricks



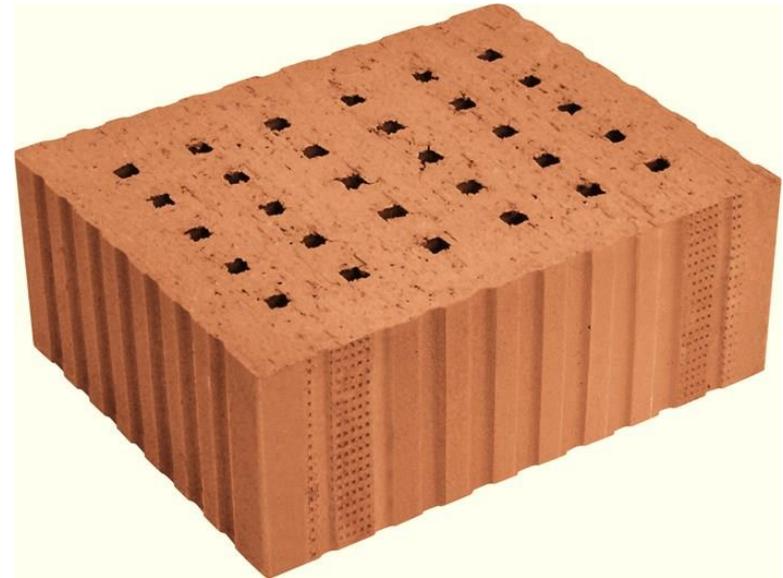


extruded perforated brick





extruded double perforated brick



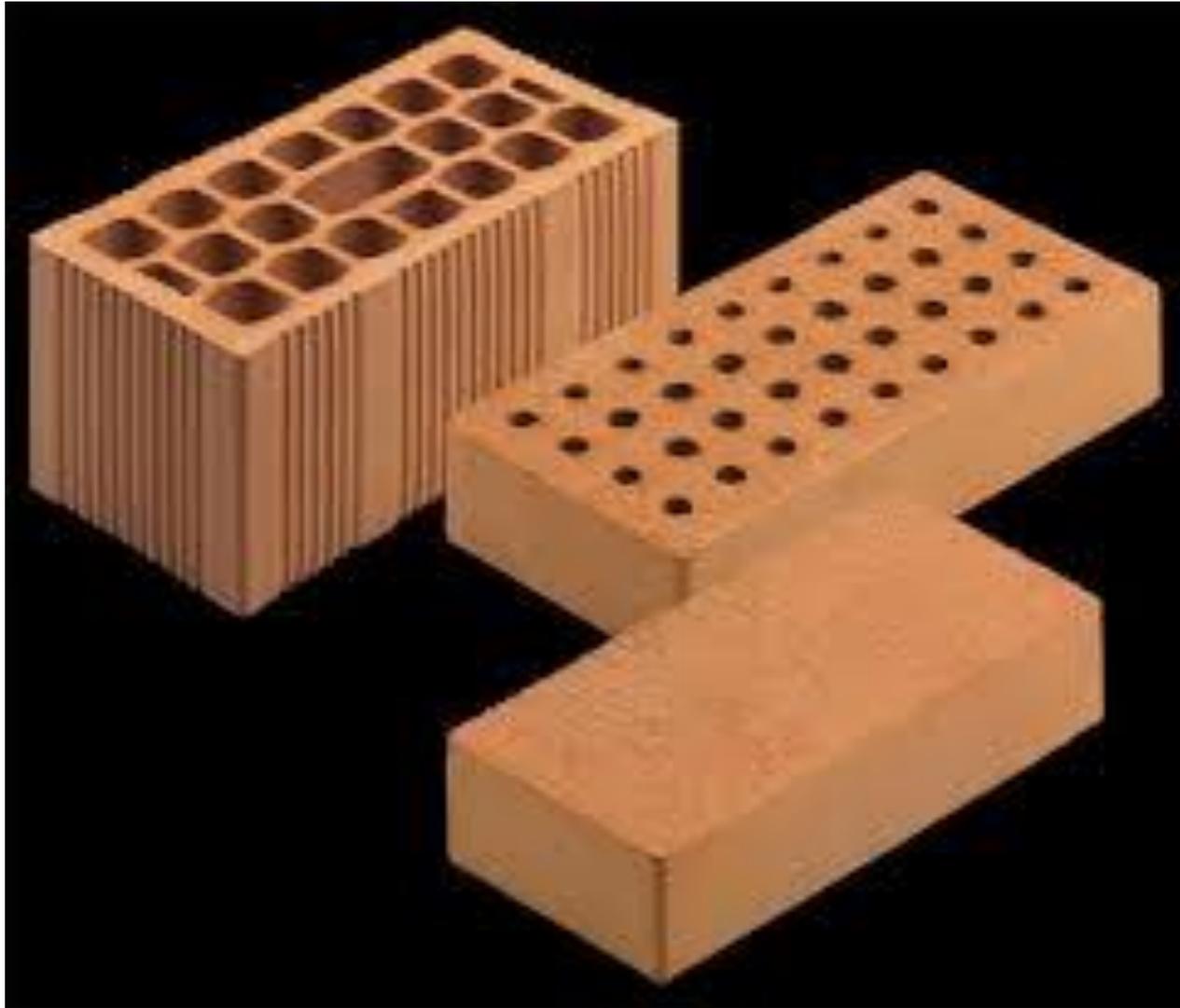


extruded perforated blocks





extruded bricks and double bricks



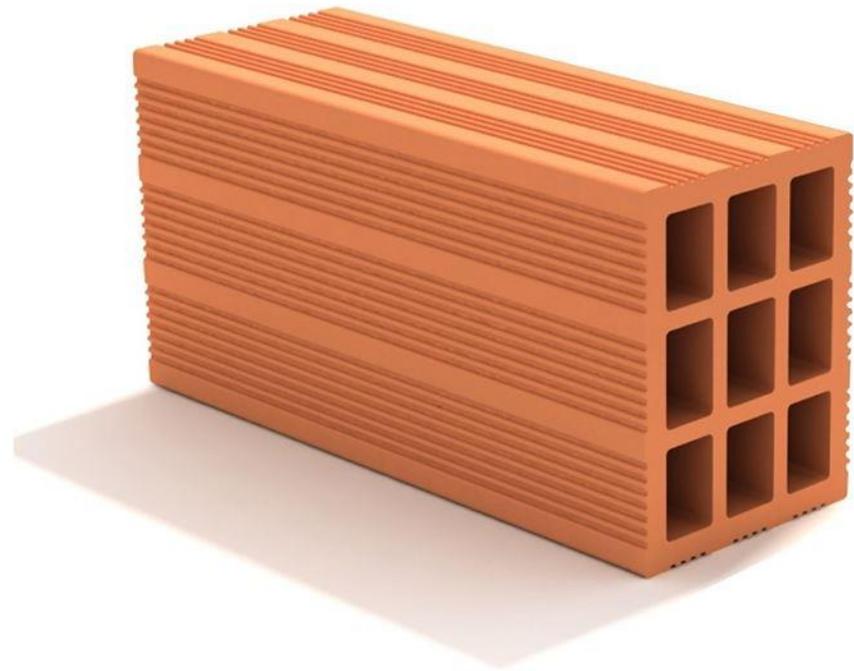


small size perforated blocks





And finally... big size blocks



Hollow blocks 20/15/10 x 20 x 40



what we could suggest

What we believe should do, it is to begin proposing technological improvements to the existing local production system, not so expensive as investment costs.

Within a field nowadays still so poor, only modest innovative investments, can be financially viable, with a compromise between the new technology, and the investment costs: for that reason, in my opinion, there are three important ways to follow:



1) where producing machines

it is difficult to think of importing equipment and machinery from abroad. Too high the purchase costs, the transportation costs, and the importation costs. **Therefore, it could be advisable for foreign companies that wish to operate in the country, to produce locally the equipment.** What can be originated outside India, it will be just the technology



2) How to manage the technology

At first, it is useful to begin, even if gradually, with bringing innovations to the production process, in order to obtain extruded bricks, and therefore perforated blocks, so as to obtain a lighter weight final products.

Because this clashes with the traditional construction systems, the dimensional increase of the finished products will have to be gradual.



which capacity of a new factory?

In my opinion, it is better not concentrating the production of brick; it is better to have small efficient production units, no more than 150 ~ 200 tons/day widely spread over the whole Country.

It could save investments, also cost for transportation of fired material, without reducing drastically the labor force.



our technical proposal



First step: treatment of raw material

The mechanization of the manufacturing process from the raw material so as to produce extruded perforated elements.



from clay treatment machines





up to the extrusion





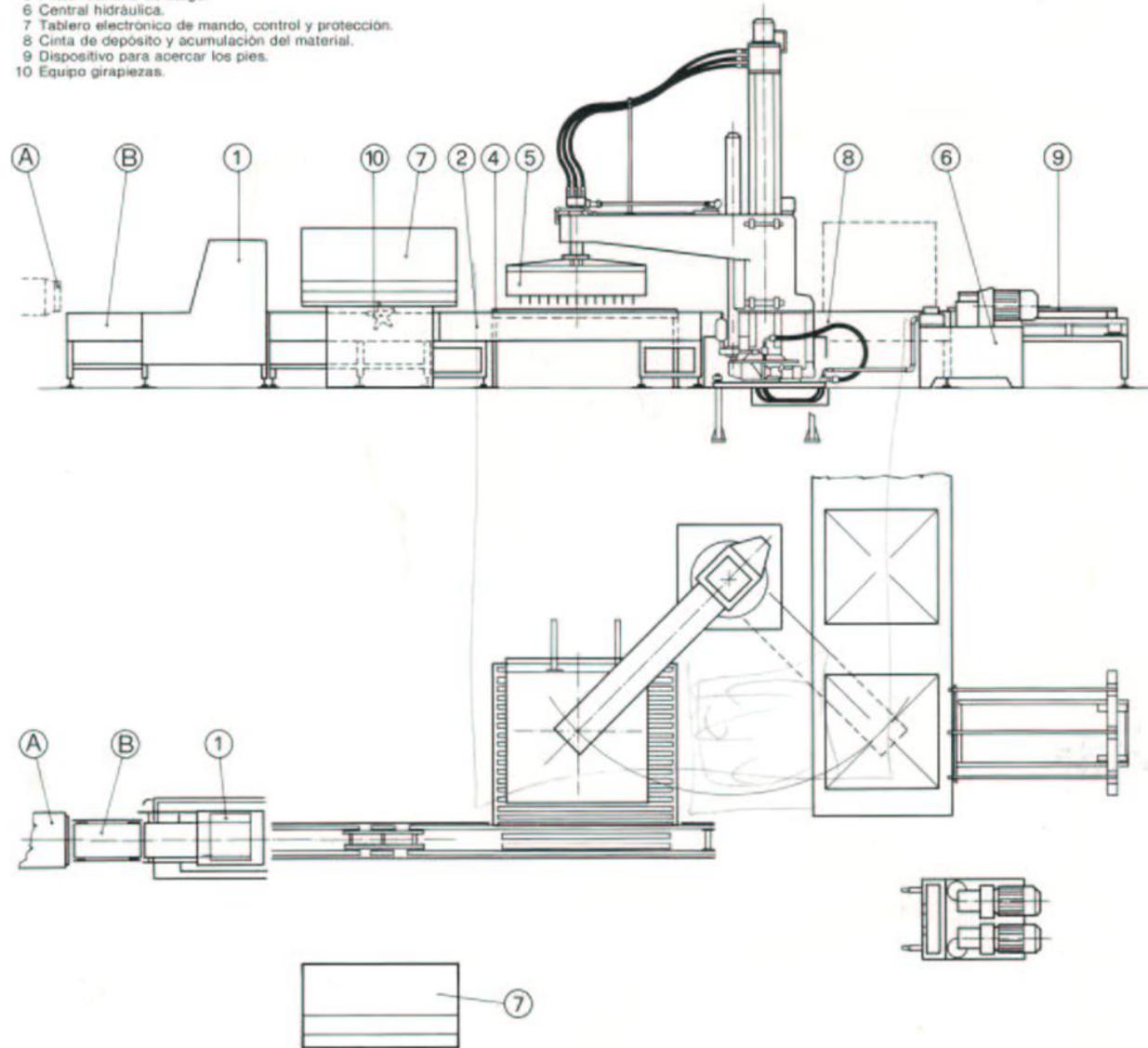
wet bricks packing machine



wet bricks packing machine



- 3 Lanzador de rodillos.
- 4 Banco de programación.
- 5 Pinza rotatoria de carga.
- 6 Central hidráulica.
- 7 Tablero electrónico de mando, control y protección.
- 8 Cinta de depósito y acumulación del material.
- 9 Dispositivo para acercar los pies.
- 10 Equipo girapiezas.



wet bricks packing machine



drying of the bricks in covered area



open air dryer



fixed drying fans





Second step: intervention on existing Hoffmann Kilns

- Interventions on the round arch Hoffman kilns by **cutting the front heads**, and if possible realizing a **refractory flat arch**, so as to manipulate manually the dried and fired material outside the kiln, and handle them with fork lifts.
- Installations of a more **efficient firing systems**, with forced smoke gases systems, so as to bring consumption around values close to 320 kcal/kg.







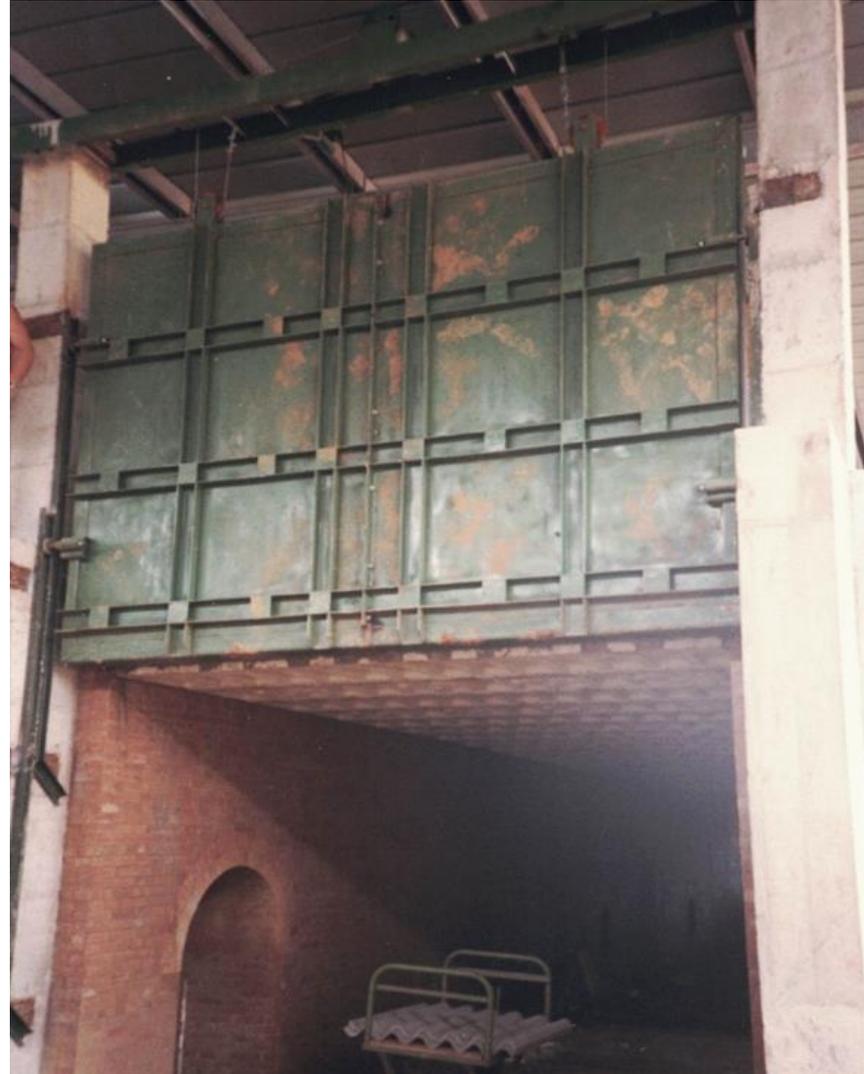
Internal gallery of a flat arch Hoffmann kiln







refractory flat arch Hoffmann kiln entrance









top soil flat arch Hoffmann kiln





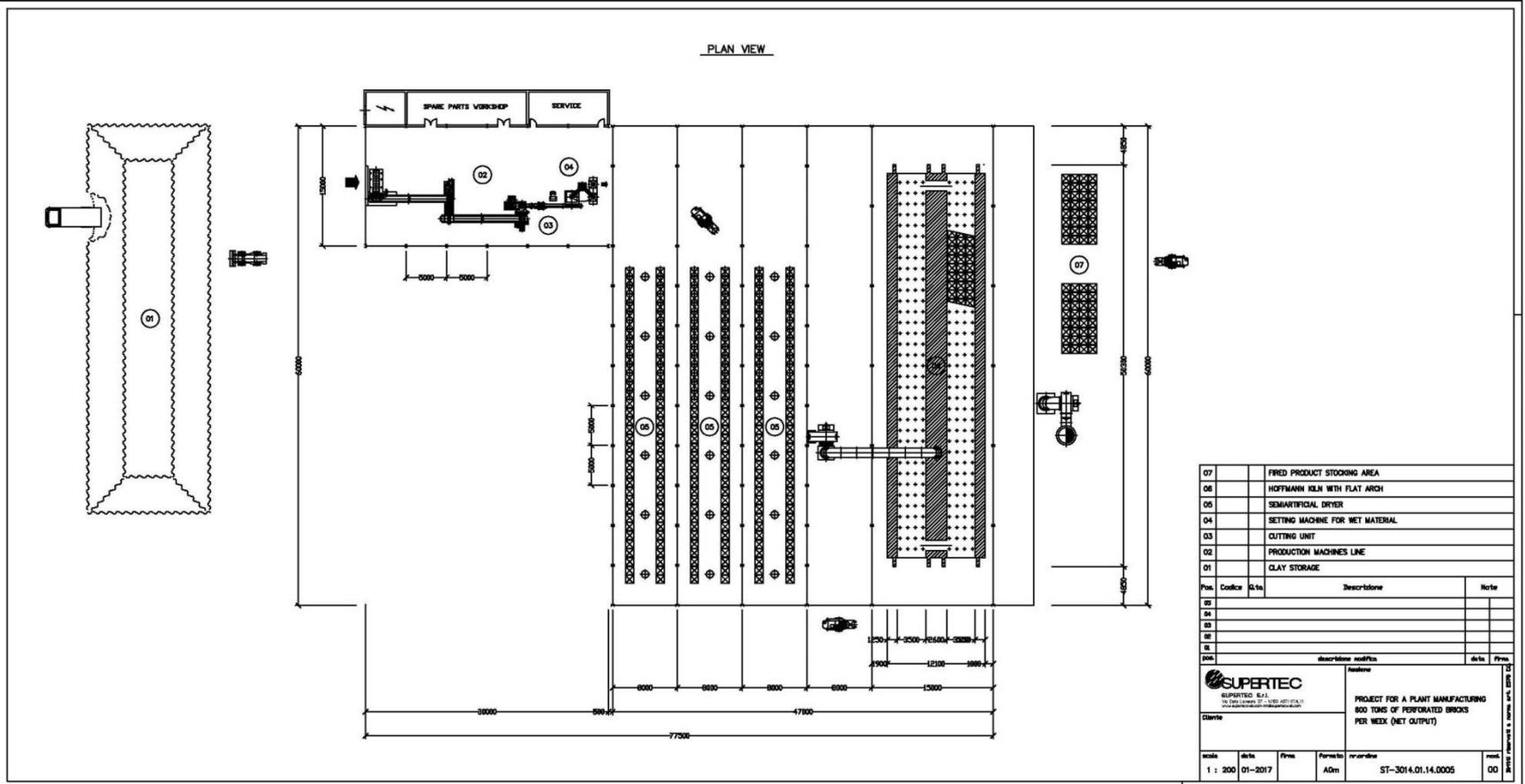


flat arch Hoffmann kiln





PLAN VIEW



07	FIRED PRODUCT STOKING AREA
06	HOFFMANN KILN WITH FLAT ARCH
05	SCHMARFBERG DRYER
04	SETTING MACHINE FOR WET MATERIAL
03	CUTTING UNIT
02	PRODUCTION MACHINES LINE
01	CLAY STORAGE

Pos.	Code	Q.ty	Description	Note
02				
04				
05				
06				
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		PROJECT FOR A PLANT MANUFACTURING 800 TONS OF PERFORATED BRICKS PER WEEK (NET OUTPUT)	
scale	data	Firma	revisione
1 : 200	01-2017	ADm	ST-3014.01.14.0005
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Third step: dryer

Amelioration of drying process, in order to be free the production from seasonal cycles, so as to extend the production period throughout the year.

we could suggest of creating an open covered drying zone, by using the heat air recovery from kiln with the insertion of fixed ventilation systems.



old round arch Hoffmann kiln in Italy



cutted heads in an Hoffman Kiln





Fourth step: mechanization

The mechanization for cutting and setting the wet material, so as to form packs of square sizes, generally one meter by one meter, and height of one meter, so as to ease the transport by fork lift of the product just formed, towards the drying zone, and in the same way, the transport of the dried material, towards the kiln.



Orion burning racks: interesting application

Starting from experience in Egypt the gas burner rack ORION H/8Q has been developed for the market of all the geographic areas where the production of bricks is based on the use of open flat arch Hoffmann kilns.

In this kind of kilns the use of mobile racks is necessary to permit the fast and save moving, positioning and removal of burners. The rack runs on lateral rails placed by the side of the kiln roof.

It is a very efficient application of an automatic system in a background where the intervention of an operator is anyhow required.

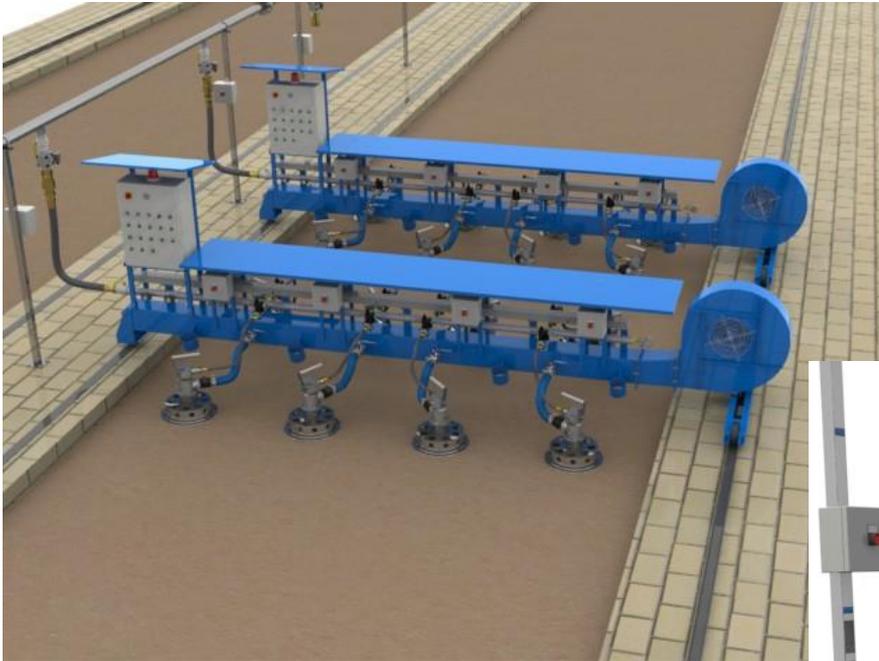
This system will help the efficiency of the combustion, as well as the improvement of health and safety conditions thanks to the drastic reduction of emission of polluting substances.

What is the advantage of using Orion H/Q8?

- Efficiency and reduction of fuel consumption and maintenance costs
- Improvement of health and safety conditions of operators
- Fast and easy positioning of burner units thanks to the compact, light and resistant structure of the burners (only 11 Kg per burner)
- Long durability of machines due to the high quality of components



picture of Orion burning Rack





ORION BURNERS FOR HOFFMANN OPEN KILN





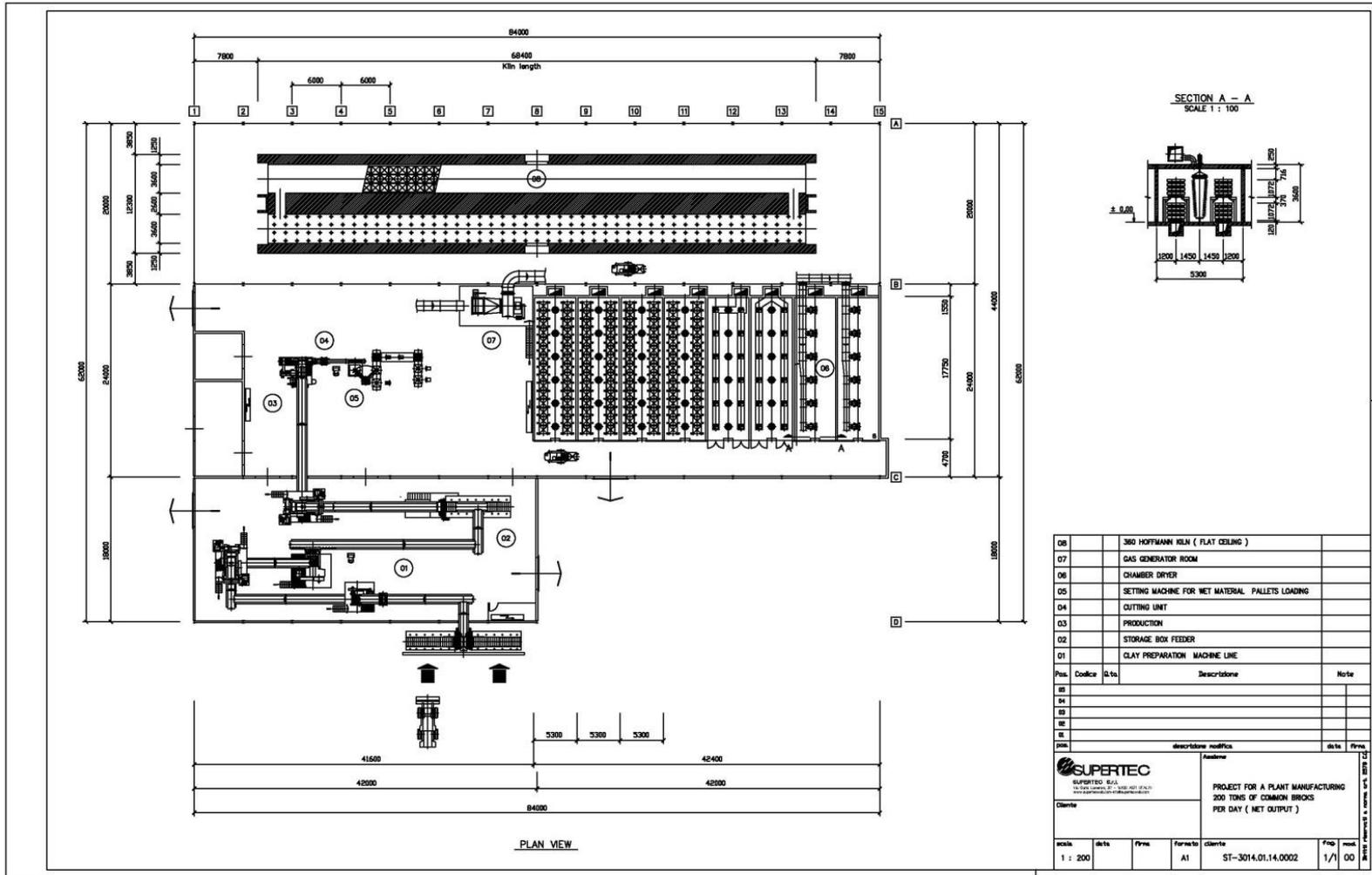
conclusion

We are talking about the first timid investments, which will immediately bring an good contribution to the efficiency of the actual heavy clay brick production system.

The result is a more efficient and economical management of the production process. The investment is modest, while the production is increased.

We do hope the above may give a small contribution to the gradual evolution of the sector, with more efficient production methods, also ameliorating of the current working conditions.

SOME EXAMPLES OF DIFFERENT PRODUCTION PLANTS



175 tons/day bricks plant



The Italian-Indian joint venture Alpina-Neptune Engitech (www.anepl.com) between Supertec and Neptune is operating in the evolution of heavy clay technology in India.

We are convinced that, once undertaken a path of technological development of the specific field in the Country, this will be unstoppable.

The combination of the European experience with the technological fantasy, that young Indian engineers are able to express, in a few years will lead to remarkable results.



www.anepl.com



<http://www.anepl.com/technical-documents/some-ideas-for-indian-brick-industry/>