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ACME BRICK

ACME Brick Company
Plant Elgin

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ACME Brick Company

Advanced soft mud brick plant at Elgin, Texas

The ACME Brick Company of Fort Worth, Texas, with 2.156 employees and one billion delivered bricks in 1999 the largest domestic brickmakers in the USA, has built a new plant for machine-made sand molded bricks in Elgin, Texas with Lingl.
Thanks to a universal system solution, the automation concept realized together with Lingl and Siemens covers all special requirements of the ACME Brick Company.

In the Elgin Works, ”wood mold look-alike” bricks will be manufactured in a variety of colors from beige to red and flashed. The plant, largely equipped with robots and straightforward in design but with technically advanced engineering, will produce in single ten-hour shifts on six days a week.
Lingl, who has already built plants for ACME in Ouchita, Arkansas and San Felipe, Texas, supplied - starting from the De Boer soft mud brick press - the entire plant, including the chamber dryer with Rotho-Quatro building, the tunnel kiln and Simatic S7 process computer automation system with Lingl software for control and regulation of the plant.

Preparation and shaping

Following the preparation the clay is passed via two single-shaft clay mixers and the necessary wet clay conveyors to the De Boer mold chain equipment combined with an automatic press, Type B16/300/72, and eight Hubert filler heads in order to produce soft mud molded or ”Old Colonial” face bricks. A dry and wet sanding unit as well as the dust extraction system delivered by Daanen B.V. provide for good sanded bricks and a dust-free working area.

Drying

The drying supports, each loaded with 16 green bricks, are placed by a loading rack in the dryer cars, which hold 2 x 22 levels each with 6 rows of green bricks. An automatic transfer car shifts the dryer cars and doors.

The dryer has 11 double chambers, each holding 8 double dryer cars. It has direct internal heating for precise matching of the drying curves to the temperature and relative humidity requirements. The drying time is 46 hours.

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Grouping and setting

After unloading from the dryer cars the bricks are doubled and grouped into layers. With the help of three robots the bricks are set onto the kiln cars 27 blades crossways.

Firing

Firing is with natural gas, in a masonry tunnel kiln completely sealed with Teflon and featuring a preheater. The tunnel kiln has a daily output of 135,000 bricks, or 310 tonnes with the reference size 222 x 76.2 x 73 mm, 2.3 kg. The total length including vestibules and preheater is 117.9 m, tunnel width 9.15 m, and tunnel height 1.21 m.
The firing time is 50 hours with a firing temperature of up to 1,170° C. The tunnel kiln is top and side fired - a process that Lingl is now using very successfully in several plants.

For this tunnel kiln Burton supplied the refractory lining of the walls and suspended ceiling as well as the tunnel kiln cars. A lightweight kiln car system was chosen in accordance with the customer's wishes. This type of car is being used here for the first time for the production of machine-molded bricks in connection with their special blade setting pattern.

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Unloading and packaging

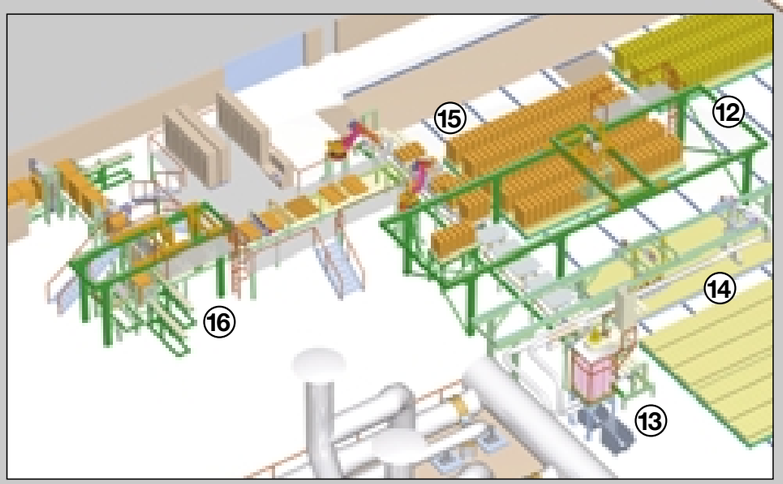
The setting blades are unloaded together with the support blocks. Two robots dehack the bricks.

The support blocks are vacuum-cleaned, aligned and reset on the likewise cleaned kiln car deck using a separate gripper device.

The fired bricks are stacked by a conventional gripper to form shipping packs with paper inserts. The packs are then strapped horizontally and vertically and positioned ready for transport by a fork-lift truck.

1 Sand mold brick press
2 Drying pallet supply
3 Dryer car loading
4 Transfer car with chamber door change-over device
5 Chamber dryer: 11 double chambers
6 Dryer car unloading
7 Brick doubling device
8 Kiln car loading
9 Storage tracks for green/red ware

10 Tunnel kiln
11 Control room
12 Kiln car unloading
13 Transport and cleaning system for support bricks
14 Kiln car deck cleaning, support brick setting
15 Dehacking of fired packs
16 Stacking of shipping packs



ACME BRICK

Facing Brick Plant

Elgin, Texas, USA

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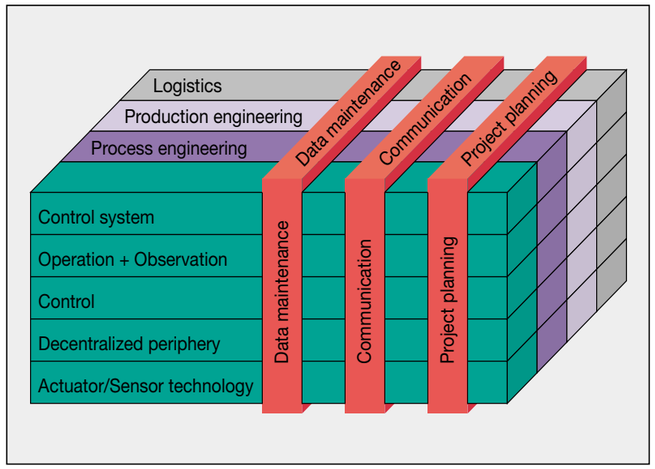
The goal of automation: a universal solution for the entire plant

The automation of the new ACME brick plant unites requirements from three different areas: process engineering, production engineering, and logistics. For the core processes of process engineering, namely drying and firing, this primarily involves the regulation of process variables such as temperature, pressure and humidity, the handling of large quantities that place high demands on system performance, and the ability to change controller parameters on line.

Production engineering requirements (dynamic performance, positioning accuracy, etc.) are determined by the machinery. The product-specific, format-specific, and flexible configuration of the control programmes also requires that large volumes of data be handled. The need to control transport systems and to keep track of kiln cars and dryer cars laden with the product places high demands on the visualization capabilities and flexibility of the standard solution.

Together, Lingl and Siemens developed a unified and universal system solution intended to meet these various requirements. The solution's universality and the ways in which it optimizes the interaction among subsystems provide the following decisive advantages, both for the plant operator and the plant builder:

- extreme flexibility thanks to the modular design,
- ability to master complex systems with the aid of standardized graphical user interfaces,
- faster production start-up due to shorter commissioning and training times,
- reduced spare-parts inventory thanks to standardized hardware components,
- environmentally friendly and energy-saving production thanks to cross-plant optimization mechanisms.

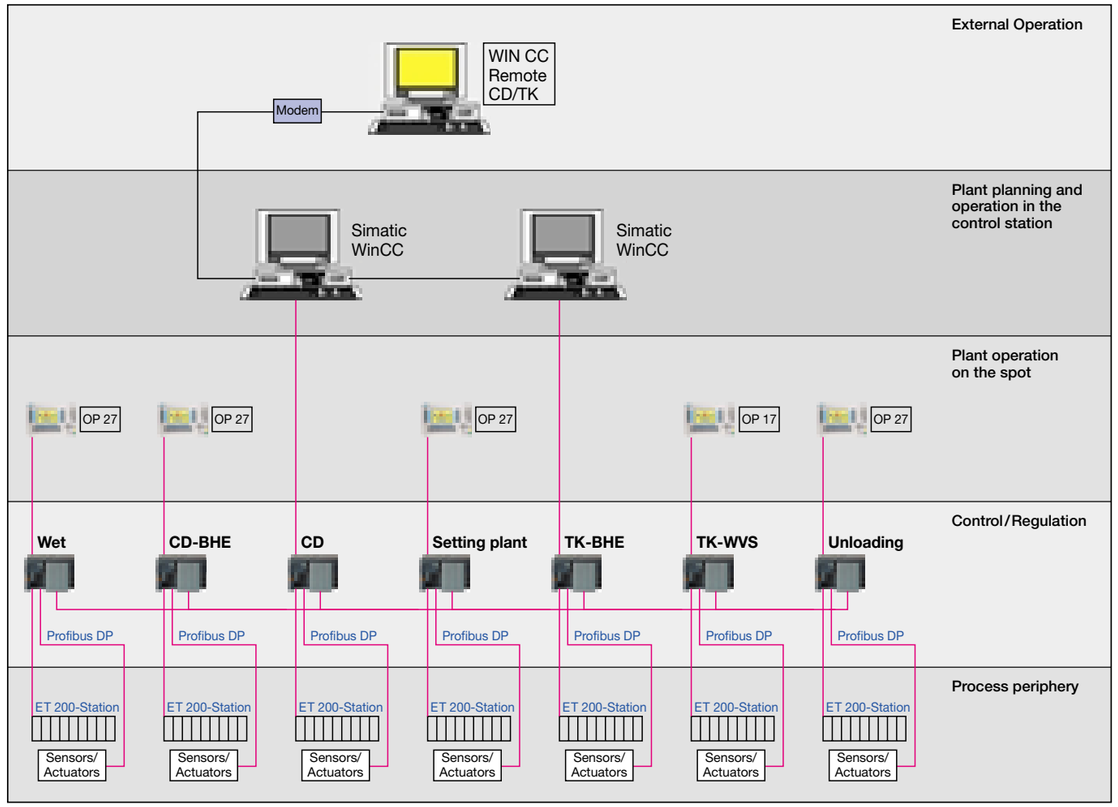


This system solution is based on components from Siemens' T.I.A. (**T**otally **I**ntegrated **A**utomation) range of products. T.I.A. is the ultimate concept for integrating automation components with regard to data storage, communication and project planning.
T.I.A. unites a wide range of components from instrumentation and control, to programmable controllers for centralized and decentralized configurations, and all the way to actuators and sensors.

Tunnel kilns and chamber dryers are controlled and regulated by a Simatic S7-400 programmable controller linked to a PC-based operator station located in the control room. The Simatic WinCC software is the basis for all operating and monitoring actions.

Simatic S7-400 systems also control the machines on the wet side and dry side through to the packaging unit. They are operated via OP27 operator panels installed directly in operator's consoles on the machines.

This solution, which was custom-made for ACME, is one possible way of configuring the global solution offered by Lingl for ceramic production plants. A more detailed description is provided below.



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Benefits based on the example of a tunnel kiln

The ”Kiln” technology package directs the firing process. It regulates the temperature and pressure conditions in the kiln, controls plant equipment associated with the kiln (air flaps, burners, valves, fans, etc.) and visualizes all major process variables for the plant operator. Some of the highlights of this package include:

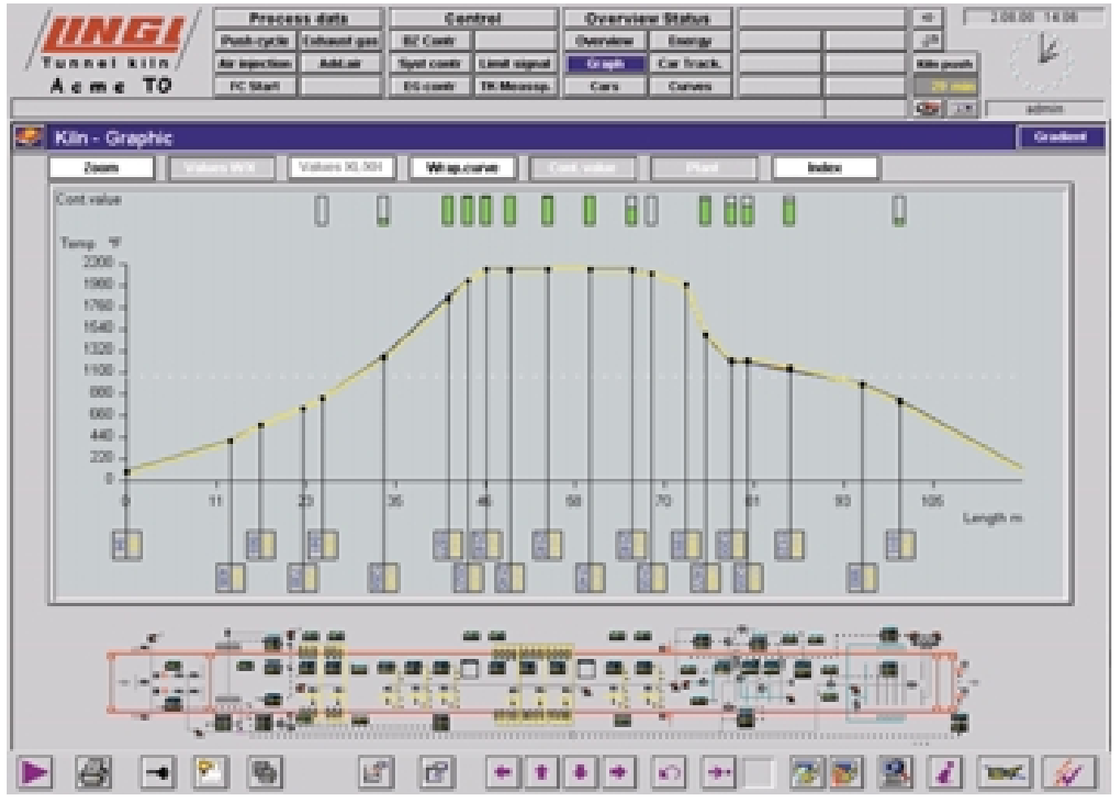
- tunnel kiln graph with car status indicator,
- controller overview and images of individual controllers with on-line parameterization and display,
- firing curve activation based on calendar or product data,
- standard interfaces to archived data and setpoint curves,
- parameterizable archiving of fault messages and process values,
- comprehensive logging (car logs, controller logs, energy balances, etc.),
- centralized product data storage.

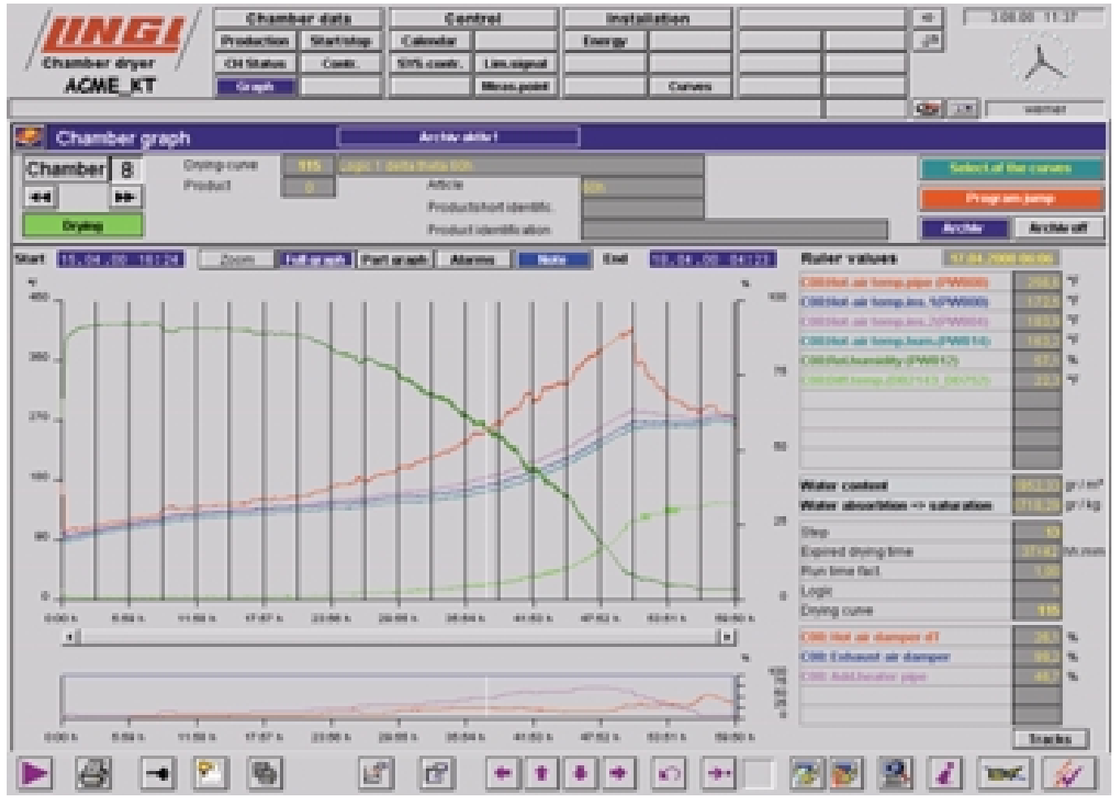
The ”Tunnel Kiln Graph” screen presents the variations in temperature along the kiln as a curve. Divergences from the setpoint value are immediately made visible in the graph by changes in color. It is also possible to hide or display digital setpoint values and actual values, defined limit values, manipulated-value positions, and car data. The graph provides operators with a continuous overview of the quality of kiln regulation. If problems nevertheless arise, the controller overview and individual controller images supply operators with all the necessary data and provide the opportunity for manual intervention. Controller parameters can also be changed on line in order to optimize control.

In the ”Kiln” technology package it is possible to maintain up to five firing curves simultaneously when a kiln is fed with different products. The activation of new setpoint values can either be linked to a specific product or regulated by a calendar. The latter method is preferred for maintaining continuous weekend operation. Firing curves can be adapted on line to different pushing times or can be imported or exported in a standard format (CSV format). This type of standard interface is also available for all archived data.

Controller logs, car-specific logs or scrollable views of the entire tunnel kiln, as well as archived fault messages and process values, can be accessed for purposes of process monitoring and quality assurance.

The convenient alarm logging system optimally supports plant personnel in the event of a fault or if plant equipment exceeds or falls below a defined limit value. The ”loop in alarm” function directs the operator to the specific plant component or controller that caused the alarm and provides plain-text explanations and instructions for correcting the problem. The integrated on-line help function also provides answers to questions on all subjects, from operation to technological requirements.





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The ”Chamber Graph” screen allows operators to display all curves selectively, including temperature and humidity variations as well as manipulated variables. The recording can cover either a period of ten hours or the entire drying process. The ruler function permits all the values to be accurately displayed at the appropriate positions.
The zoom function provides a more detailed view; using the mouse, the operator draws a ”lasso” and the x and y axes are automatically adapted to the circled area. The integrated on-line help function also provides answers to questions on all subjects, from operation to technological requirements.

Summary

The ACME Brick Co. made the decision to entrust its plant equipment and system automation to Lingl for a number of excellent reasons:

- As a standard package, the tried and tested automation solution from Lingl and Siemens met the specific requirements of ACME Brick Co. in many of its details.
- The overall system covers an extremely wide range of functions.
- The individual components are highly dependable.

The use of standard Siemens products also allows taking advantage of regional support and Siemens' worldwide service and spare parts organization.

Technical Data

Production:	Sand molded facing bricks ”wood mold look-alike”, in the colors beige to red and flashed
Reference size:	222/76.2/73 mm, 2.3 kg
Hours of work:	1 shift/day (10 hours), 6 days a week
Capacity:	310 t = 135,000 pcs./day

Lingl chamber dryer

- 11 double chambers for 8 double dryer cars each
- Chamber door change-over device on transfer car
- Drying time: 46 hours

Lingl setting plant

- Grouping conveyor with brick doubling device
- Firing packs are set by 3 robots in the form of blades 14 layers high, 27 blades across the kiln car width

Lingl tunnel kiln

- Brick kiln completely sealed with Teflon, top and side fired with natural gas.
- Length incl. preheater and vestibules: 118 m
- Firing channel: 9.15 m wide, 1.21 m high
- Firing temperature: 1,170 °C
- Firing time: 50 hours

Lingl kiln car unloading plant

- Device for simultaneously transferring the brick blades together with the support blocks.
- The brick blades are dehacked in a stepped down manner by 2 robots.

Plant control

General system solution for the entire plant with Simatic S7-400, WinCC and Lingl software.

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