

# OFFER NO.M23099

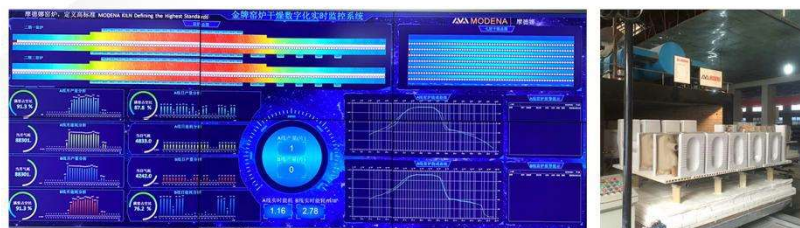
Energy-saving Roller Kiln with Large Output for bricks  
&  
Energy-efficient Dryer

## PROJECT:

Supplying the Production Line For bricks  
5-layer dryer  
Firing kiln



To: Tehran white brick  
Manufacturer & Contractor  
**Modena Technology Limited**  
Date: June.29th, 2023



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### National High-Tech Enterprise

CE Safety Certificate of European Union

President Unit of China Kiln Association

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## SALES CONDITION

**DELIVERY TIME:** At Seller's factory within 4 months after the contract is coming into force

**PACKING:** Included

It Covers:

-Storing of the goods waiting to be shipped;

-Preparation and packing of the goods;

The materials will have to be kept by buyer in covered and guarded areas.

All the precautionary measures necessary for the correct preservation of the material will have to be taken, waiting for its installation.

**INSTALLATION:** It includes the following phases:

-Positioning of the equipment in conformity with the plant layout;

-Possible unpacking;

-Assembling of what is necessary for the completion;

-Connection with the various electrical, pneumatic uses or other;

-Adjustment of the equipment ;( levels; running way of the motors;

-Installation of the safety devices;

-Idling test of the equipment.

What above-mentioned produces the subscription of the Installation End Certificate.

**START-UP:** Included

It includes the actions necessary to put the plant in operation until

The achievement of the production contractual terms.

What above-mentioned produces the Acceptance Certificate of the Plant.

Possible parts excluded from the commissioning due to lacks can be indicating in the same certificate.

**TRAINING:** Included

It is the training phase of the Customer personnel.

**QUALITY GUARANTEE:** The Seller shall guarantee that goods is completely brand-new and shall conform to the technical specification as stipulated in this contract.

The mechanical guarantee of the contract equipment is 12 months after

the commissioning date, or 18 months from the date of picking up goods in case the commissioning cannot be finished due to Buyer fault, During the Guarantee period, if the accessory (ies) of equipment(s) is/are damaged, the Seller will replace or repair. (except the Buyer improper use and tear and wear parts) .

**PAYMENT:** 30% as down payment the contract comes into force after receiving the down payment by the seller;  
70% by an Irrevocable Letter of Credit at sight; payable against shipping documents;  
Or other way to be agreed.

**REMARK:** During machines installation and commissioning the following costs incurred by Technicians of the Seller shall be borne by the Buyer,

- Board and Lodging,
- Laundry,
- Pocket money,
- Local Transportation,
- Round way air ticket.

**EXCLUSIONS:** Not included in the supply:

- Transport and lifting equipment on site, with their operator, and also the crane for the assembling.
- Brickwork and civil engineering works to be performed according to our drawing.
- Auxiliary services (Natural gas, compressed air, electricity, grounding, etc..), main emergency generator, water treatment plant and relative drawings.
- All the pipelines, included the chimneys, for the auxiliary services and relative drawings and possible insulation.
- Anchor bars for foundations and various walled parts.
- Hydraulic and lubrication oil.
- Consumption material for the installation.
- E.M.F. feeding to our electric control panels with 3-phase line with neutral wire.

The feeding positions will be indicated on the general definitive layout. The tension must be within a maximum limit of variation of 10%. The feeding lines of the electric

panels must be protected with differential security breaker with adequate sensitivity, as foreseen by the norms in force. The European reference norm is the EN60204-1.

- Skilled and unskilled labor for the plant installation.
- The installation shall be carried out with the use of workmen (masons, mechanics, electricians and unskilled workers) made available by the customer.
- The work direction shall be carried out by our technicians.
- Skilled and unskilled labor for the plant start-up.
- The start-up and the commissioning of the plant shall be done together with the customer's personnel (workers and skilled technicians). The co-ordination is carried out by our technicians.
- Anything else not expressly indicated herein.

**VALIDITY OF THE OFFER: 30 days**

## DESCRIPTION OF THE SUPPLY

(01) . Drying Dept.

201      06DRP                      5-layer Dryer *mod. MRD- HB5 /W2400 /L14.7M*                      1

The horizontal roller dryer, composed of modules that provide 5 continuous channel to dry the green bodies, and realize the rapid dry in a varied dry cycle (in terms of the stability of technical parameters).

The drying process in the horizontal dryer can be divided into following zones:

- Pre-dryer--humidity exhausting zone
- Heating zone
- Constant drying rate zone
- Retarding drying zone
- Equilibrium drying zone

In the pre-dryer--exhausting zone, the humidity in the dryer is suctioned by fan. In heating zone, the heat transferred to tiles is more than the requirement of evaporating water, then the temperature of the tile is rising. Only partial humidity of the tiles is discharged. In constant rate drying zone, the free water in the tile is discharging, meanwhile the water in the middle of the tile is moving to tile's surface. In the retarding drying zone, the rate of water evaporating slows down. In equilibrium drying zone, the moisture of the tile reaches a balance that the rate of water evaporating is zero. After above-mentioned zones, the humidity of the tile is normally around 0.8% that ensures the dried tile suit for fast firing.

Heat resource of the dryer is Recycled hot air and 5 sets of hot air generator

Each module is formed by a prefabricated carbon steel frame, which supports the insulating lining, which is externally protected by plugging sheets. The special structure in the position of rollers can ensure an excellent airproof of the dryer. It means saving energy.

The dryer is using the 45° helical gears for its driving system. The gears running in the lubricated oil ensure a smooth moving of the system. 1 inverter control the speed of all driving motor. The dryer can fit the production of different kinds of tiles; its drying cycle can be adjusted in a quite wide range.

4 inverter control the speed of all driving motor. The dryer can fit the production of different kinds of tiles; its drying cycle can be adjusted in a quite wide range.

The humidity in the dryer can be taken out rapidly and efficiently without being effected by atmosphere and seasons because of its fans and piping reasonably and specially arranged

### 1. Basic datum

products:	70	×	330	mm
shrinkage:	< 9	%		
drying cycle:	50	~	100	min
fuel:	NG			
thermal value:	8300		Kcal/Kg	
drying fault rate:	1	%		
working time:	24	hours/day		



**2. Technical parameter:**

Length	14700	mm
Nominal width	2400	mm
Modules quantity (2800) mm	6	modules
Number of channel	3	layer
Drying temperature	<250	°C
Drying resource	Recycled hot air + 5 sets of hot air generator	
Inlet body humidity	6	%
Outlet body humidity	0.8	%
Roller quantity	2640	pieces
Roller material	seamless steel tube	
Roller diameter	50	mm
Center distance between rollers	63.63	mm
Roller length	3800	mm

**Overall main dimension**

Standard module width	3550	mm
Roller extraction space (from the kiln axle)	6000	mm

**3. Composition of the dryer**

- Structure modules, which are made of steel tube and plate A3. Insulations rock fiber board, STD. Fiber.
- Driving 45° helical gears, driving motors that are controlled by inverters.
- Fans:

Fan name	Qty.
suction fan	1 set
blowing fan	5 set

<b>08GT</b>	<b>Gas train /Italy-- included</b>	<b>1</b>
<b>06IBF</b>	<b>Inverter for blowing fan for dryer-- included</b>	<b>5</b>
<b>06ISF-A</b>	<b>Inverter for suction fan for dryer-- included</b>	<b>1</b>
<b>06RHAP</b>	<b>Recycled hot air pipeline for dryer</b>	<b>1</b>
	<b>HMI Control</b>	<b>1</b>

Recycle hot air pipe is a pipe system which send the hot air collected in cooling zone (even the hot smoke collected from the end part of kiln ) to dryer for drying tile. Thanks to the recycle hot pipe, the recycle hot air from kiln can be used again with energy saving. The recycle hot air pipe is composed with air pipeline (made of A3 plate with 2mm thickness), flange, support, expansion seams (joints) and so on.

**(02). Firing Dept.**

<b>201</b>	<b>08FRKP-A</b>	<b>Firing kiln mod. MFS /W2400/L67.2M</b>	<b>1</b>
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The kiln is composed by a set of modular units, connected to realize a reaction chamber thermally isolated and divided longitudinally by the rollers. On the lateral walls, over and under the rollers, some burners, whose positions and regulations allow obtaining zones with different temperatures, are foreseen. The kiln is divided into the following zones, whose relative width is in function of the quality and quantity of the product to fire:

- Pre-kiln exhausting
- Preheating-firing
- Rapid cooling
- Natural cooling
- Final cooling

In the pre-kiln exhausting zone, the remaining humidity is eliminated from the material, still green, and it is gradually heated.

In the preheating-firing zone, the physical transformations and the chemical reactions, which characterize the finished product, come. The heat transfer to the product is obtained through groups of burners controlled by regulation valves for the air and for the fuel, and able to obtain the most suitable firing curve.

In the rapid cooling zone, the material undergoes the reduction of the temperature, in two phases, the first one through direct introduction of room air with modulated capacity to cooling the materials down to 650-700°C; the second one through room air by means of heat exchanger composed by stainless steel pipes, placed over the rollers plane.

In the natural cooling zone, the material is cooled at temperatures which are around 500-350 °C, taking out air from the same zone through fume hoods connected to a fan (the deducting air, from this zone, can be employed in other applications, because it is air above all clean; in some cases, it is mixed with the air coming from the a.m. heat exchanger).

In the final cooling zone, a temperature sufficiently low is reached to make the material handy. It is equipped with a direct cooling system, by means of radial fan which blow room air over and under the rollers plane through a circuit inside the modules. The air suctioned from this zone were mixed with air acting as combustion air. It can reduce fuel consumption in this way.

## MODULES STRUCTURE



Each module is formed by a prefabricated carbon steel frame, which supports the insulating lining, which is externally protected by plugging sheets (frames and sheets are supplied). Sheets are easily removable for inspection and normal maintenance. Moreover, an air gap is created to prevent overheating in the zones with high temperature and the condense formation in the cold zones.

Frames are equipped with suitable checks for self-aligning, during the assembling phase.

The kiln modules are composed of a portable framework in metallic tubular under supported by two longitudinal sections.

Each module puts on steel rollers, which flow on a plate fixed at the ground with expansion reinforcements, such plate is used as flowing surface for the rollers on which there is the kiln.

In the middle of the kiln, there is a point called "fixed point" from which movements develop during the dilatation and the contraction phases.

#### CARPENTRIES AND PIPINGS

In the supply, the following carpentry and pipes are foreseen:

- Supporting platforms for pipes
- Service and fans support planes with the relative stairs and rails
- Pipes for the combustion air and the cooling-pipes air distribution for the combustion deducting until the fan.
- Excluding chimney pipes.
- All the pipes are varnished and in carbon steel sheet, complete with flanges, ant vibrating connections, expansion joints, manual shutters for the regulation of capacities and pressures.

#### INSULATING LINING

It is chiefly composed by refractory bricks with high strength, both for the lateral walls and the bottom.

Lining has a changeable thickness in function of the max. Exercise temperatures. Refractory bricks with high strength and insulating ones with suitable mortars, insulating panels in ceramic fibers in the zones not directly exposed at the kiln's inlet atmosphere are foreseen.

***Kiln roof is suspended and constituted by cordierite-mullite plate.*** Different types of expansion joints, made in ceramic melted fibers with high temperature to absorb the tensions which are created during the

ignition and the blowing-out phases of the kiln.

On the lateral walls, the burners blocks housing, the inspection holes for the flame and the firing product control and trims for rollers passage, are foreseen; besides, a lot of doors, placed under the rollers plane and which facilitate inspection and the firing channel cleaning, are foreseen.

The parts more subject to wear, as for instance the kiln in normal exercise can, easily substitute trims for the roller passage.

Adjustable diaphragms, positioned on the top and composed by ceramic fibers in the preheating and firing and in steel in the normal cooling, are foreseen. So, on the floor, barriers in insulating light bricks, dry assembled, are foreseen.

## COMBUSTION PLANT

The following parts mainly compose the combustion plant:

- Burner
- Regulation group
- Air and fuel distribution system

## BURNERS

The kiln is equipped with high speed burners

## REGULATION GROUP

The burners are gathered in regulation zones, each one of which is composed as follows:

- Modulating self-commanded valves for fuel.
- Thermocouples to transmit the temperature
- Thermos regulators PID

When temperatures are set-up according to the firing curve, the thermos regulators, on the basis of the information received by the thermocouples, control through a servomotor, the simultaneous opening and closing of the fuel modulating valves.

The reply speed to the temperature variations and the capacity to keep temperatures at the set-point values in case of production vacuums reduces the problem of different tonalities and gauging of the final

product and also reduces the fuel consumption.

At this purpose, it can result useful to use adjustable diaphragms placed on the kiln's top. By this, an excellent firing uniformity of all the tiles independently from their loading position. A micro-pressure meter shows the pressure inside the kiln.

#### FANS

All fans are equipped with motor, anti-vibrating joint and safety device.

#### ROLLERS MOVEMENT SYSTEM

The rollers rotation is composed by 45°helical gears to be driven by a motor on each three modules, the gears are immersed in the lubrication oil to guarantee the stability and reliability of the drive.

#### CONTROL PANNEL

No. 1 control electric board, formed by varnished metallic carpentry, complete with general switch, safeties and protections for the fans' motors and for the motor of the movement, alarms and electric connections to the self-regulation plant, synoptic board,

For the regulation of the temperatures will be supplied:

- Self-regulating, type P.I.D. for combustion
- Self-regulating, type P.I.D. for cooling
- Self-regulators, type P.I.D. for heating ex-change

Acoustic and visual alarms for the different parts, as reported below:

- Chimney fan thrust meter alarm
- Chimney tube Over-temperature alarm
- Min. fuel thrust meter alarm
- Max. fuel thrust meter alarm
- Roller motors alarm
- Inverter interference alarm
- Tension lack alarm
- Over-temperature alarm

3) Piping is insulated by fiber blanket and aluminum sheet

**3.4. Combustion system**

- 13 Sets of Linear valves (ECONEX) and servo motor (ECONEX)
- sets of burner + burner controller(MODENA/FSC-1200 ) and solenoid valve
- 104 (MODENA )
- 104 sets of alumina burner blocks +SiSiC burner tube
- Gas pressure reducing valve, safety valve, flow meter( Madas ) all from Italy.

**3.5. Driving system**

- 1) 45° helical gears drive the rollers
- 2) One motor for every No.3 modules
- 3) Driving motors are controlled by independent inverters, with the function of oscillating. Differ-speed of adjacent rollers will be adopted in high temperature zone.

**3.6. Control system**

No. 16 automatic thermo-regulators(WEST), multi-temperature Visualization pressure switch for fan of chimney and combustion air and gas reduction group. .

Main electric components inside the control board will be imported or joint venture products. The distance between the control board and last module of kiln is not greater than 10 meters.

- 16 auto-regulating control circuits on the kiln in which
- 13 circuits are for temperature control and 1 for rapid cooling, 2 for heat exchanger and 1 for fume suction.

**3.7. Kiln out look**

Decorating plate is made of 1.2mm steel plate, and painted..

**08MPB                      Micro-porous block(for high temp. zone) --included                      1**

Micro-porous block used in the high temperature zone to reduce the heat loss and energy saving.

- Temperature grade                      1000°C
- Bulk grade ρ                              240-300 kg/m<sup>3</sup>
- Specific heat c                            1.05 KJ/kg K
- low heat conductance λ , λ less than 0.03 W/mk.

**08GT                      Gas train / Italy -Included                      1**

<b>08TIS</b>	<b>Advanced Insulating System / TIS system -Included</b>	<b>1</b>
<p>-The application of special insulating materials in the combustion branch piping / kiln roof /kin bottom and other jointing areas in the kiln will improve the insulating performance with which the kiln gas consumption may improve by 3-5% and the kiln life may extend.</p>		
<b>08PBG</b>	<b>PRV for each burner group</b>	<b>42</b>
<b>08GM</b>	<b>Gap management system--included</b>	<b>1</b>
<b>08IDS</b>	<b>Integrated Driving System (including TMA movement / roller breakage alarm system)-Included</b>	<b>1</b>
<p>EDS is the latest driving system which is a technology integration, including:</p> <ul style="list-style-type: none"> <li>- More stronger driving componen</li> <li>- Wear-resisting gear made from high-performance new materials;</li> <li>- More scientific speed ratio of gear, used for the kiln modules which before rapid cooling zones;</li> <li>- Rollers with special shape which can adjust moving track of tiles;</li> <li>- Rollers breaking alarm system which can alarm in time when rollers are broken to avoid production loss.</li> </ul> <p>EDS system can effectively guarantee the moving stability of tiles inside kiln, improve the moving track of tiles, increase the flatness of tiles, greatly extend the lifetime of kiln driving gear to two times longer than the original gear and ensure tiles can move with more reliable and safer driving system.</p> <p>TMA movement (conic roller):</p> <p>This kind of roller can ensure the tiles moving in the kiln is straight ; when the tiles moving in the preheating zone, the center tiles moving slowly, this roller can help calibrating the straightness. Ensure the tiles moving in pre-heating zone in straight line. It is prevent the tiles deforming due to tiles moving.</p> <p>With Roller breakage alarm system.</p>		
<b>08ACRHA</b>	<b>Automatic control for recycled hot air supply from kiln to dryer-Included</b>	<b>1</b>
<b>08SM</b>	<b>Econex servomotor and Linear valves</b>	<b>1</b>
	<b>Wide range drives for different extruded product</b>	<b>1</b>
	<b>Price difference of the stainless steel pipe for upper combustion pipe</b>	<b>1</b>
<b>202</b>	<b>08PC-A Computer control system for kiln</b>	<b>1</b>

It feed the tiles to the dryer,

The machine is composed of:

- No. 2 connection group to the product transport line;
- No. 2 belt step-by-step unit for forming the product rows;
- No. 1 shunting and feeding roller device for the pre-arranged rows;
- No. 1 roller unit to recover the empty spaces between the rows;
- No. 1 feeding electric board with electronic control equipment with PLC;
- No.1 lifting devices.

**302 06ET Elevator (3 layers) 1**

Elevator is equipped with 3 layers. Driven by H-type synchronous belt and controlled by PLC

**303 06LRTFI Dryer loading roller table(five layers) 1**

It arranges the tiles sequentially and convey into the dryer.

The machine is composed of:

- No. 5 shunting and feeding roller device for the pre-arranged rows;
- No. 5 roller unit to recover the empty spaces between the rows;
- 45° Helical gears drive the rollers;
- Overrun coupling;

**304 06URTFI Dryer unloading roller table(five layers) 1**

It collects the rows of tiles exiting from the dryer.

The machine is composed of:

- No. 3 barriers for aligning the product rows coming from the dryer;
- No. 3 row conveying roller device driven by motors;
- 45° Helical gears drive the rollers;
- Overrun coupling;

**305 06ET Elevator (3 layers) 1**

Elevator is equipped with 3 layers. Driven by H-type synchronous belt and controlled by PLC

**306 06ULMS Dryer unloading table 1**

It collects the rows of tiles exiting from the dryer compensator & the firing kiln.

**307 08COM25A Compensator in front of the kiln/CP250Y 2**

his machine is using to store tiles that are going to be fired. The tiles in the machine shall be released when there is empty in the glazing line, to ensure no empty in the kiln.

Technical parameter:

Tile size 400\*400 ~ 600x600mm