Horizontal Roller Hearth Flat/Bent Glass Tempering Line Model:

NG-12H3610II (3.2 -19mm/3.2-12mm)
Technical Parameter refer to Contract Part Two

Brand Name: North Glass

1. Description of the Equipment

1.1 Brief Introduction

The furnace includes loading table, heating section, bent formation/quenching section, flat quenching section, unloading table, blowing & cooling system and control system. It is a reverse operation system which one direction is flat temper glass working way, while the reverse direction is bent temper glass working way. It is used to manufacture flat and cylindrical tempered and heat strengthened glass for architectural, furniture, home appliance, shower-cabin components etc.

1.2 Loading Table

The loading table is composed of rubber-covered rollers. When the glass is put onto the rollers, the glass will be conveyed automatically to the entrance of the furnace where it will be in ready-to-enter-furnace position and the rollers stop moving. It will send the glass into the furnace once the computer control system gives enter instruction.

1.3 Heating Section

The structure of the heating section is of a double-layer box type covered with thermo-insulating material. Inside the section there is a conveyor system with high temperature resistant ceramic rollers, which are imported from well-known manufacturers, i.e. Vesuvius, France; Ceradyne, USA; Haldenwanger, Germany, etc. Heating elements and radiation plates are installed on the upper layer and lower layer of this section. The upper layer radiation plate is special heat resistant and anti-corrosion cast material. The heating element is of an integrated part with spiral type resistance erected on ceramic part, it's easy to replace. When the glass is going to enter the furnace, the front door of the heating section opens, the rolls of the loading table and heating section move at the same time. When the glass is in the furnace, the front door will close and the glass on the rollers will be moved back and forth at the distance calculated by the controlling system automatically, so that the glass will be heated evenly. The upper section can be lifted up by remote control for maintenance. The heating elements are in matrix layout. The upper side has 40 heating elements, and lower side has 25. Each has one independent control loop.

1.4 Flat Quenching Section No. 1

The quenching section is divided into upper and lower parts. It is used for quenching 3.2-3.5mm glass sheets. The nozzles are made of aluminum alloy, and the upper and lower clearance can be adjusted according to the quenching demand for different kinds of glass. In among the blast heads, there are a lot of rollers conveying the glass sheets forwarding. When the glass sheets come out of the furnace, the rollers here will move synchronously with the rollers in this section, to transit the glass sheet toward the next quenching section. At the same time, high pressure air will blow to top and lower sides of the glass through air tunnel and blowers. The air pressure and flux are under control and adjusted according to different process of glass.

1.5 Flat Quenching / Cooling Section No. 2.

This section has the same structure as quenching section 1. The difference is that the blower used in this section is just for quenching 4mm to 19mm thickness glass and cooling down 3.2-3.5mm glass sheets. When the glass sheets move to this section, the rollers in among the blast heads, will run back and forth to make the glass to be even quenching and cooling.

1.6 Bent Quenching Section

It is composed of upper and lower straight rollers. When the glass is transferred to this section, the upper and lower straight rollers will change their shapes to form a curved clearance, which is just like an assumed mould. The softened glass sheets are oscillating in the assumed mould to be curved, and there is no mould needed. The bending/tempering section and the formation section are just one combined part. The glass will be tempered during formation. When tempering flat glass, bending/tempering section is the same to a part of the flat blast heads. The glass will oscillate with the rollers for even quenching.

1.6 Bent Cooling Section

Bent Cooling section has a 22Kw fan system. The air pressure of the fans is set by the openness of the fan damper, which is controlled by computer. This section is used for cooling down 6-12mm glass sheets.

1.7 Unloading Table

The unloading table is the same as the loading table. When the glass is transported to the end of the conveyor, the rollers will stop, and the glass can be taken away by hand, or by robot, if there is available at the customer’s factory.

1.8 Control System

The control system includes the followings:

- Process parameters storage and re-call, such as glass thickness, size, color, glass type and maybe different sources of float glass and etc. Whenever you produce a new order for different thickness, size, color, type, source and etc., you just enter the process parameters, and the

system will memorize these process data with no limitation. Next time, when you have the re-order, or the same order, you can re-call the data, and the machine will automatically use the stored processing data to produce.

- Controller for roller driving system.
- Controller for the temperature control.
- Controller for quenching control.
- Controller for formation control
- The abnormity alarming system would warn while trouble happens to indicate how to solve this trouble.
- The furnace has auto pre-heating function. After the shift of a day, the furnace will be in the stand-by status, only less than 25% of heating power will be consumed, while the ceramic rollers will be still running. And ahead of working time on the next morning, the system will start up to heat up to the working temperature until the operator begins the production.
- The main industrial control computer is installed with the terminals at the control desk. Display screen can provide users with analog process status: main screen, process parameter screen, operation and maintenance screen and system parameter screen. The system has reading and writing function for process parameters, automatic control, unit equipment operation and test as well as self-diagnosis, as well as display alarming function.

a) Main drive control system is accomplished by the inverter system which is controlled by computer. On-line of every part is controlled by computer.

b) The main screen is the page displayed on the monitor during normal production. The contents displayed directly in English are the statuses of glass in the furnace, driving system, temperature at each zone, time of heating, quench and cooling, actual pressure, set point of fans and length sum of pieces of glass in the furnace. This screen is for the operator's notice. The process parameter screen records the designed moving distance of loading table when the pedal switch is actuated by the operator, temperature set point of upper and lower furnace, pressure set point of fans, quench time and cooling time set point. These screens are frequently used for normal operation. Maintenance screen is used by maintenance people to test every part of the system. System parameter screen is used by the manufacturer, in order to test the machine, it is not for any other people using, otherwise the machine may be damaged. The system also has some supplementary screens, which will not be explained here.

2. Technical Parts

2.1 Technical Specifications

2.1.1. Flat Glass

2.1.1.1 Glass thickness range:

Tempering: 3.2-3.5 mm with tolerance +0.2/-0.0 mm

4-19 mm with tolerance +0.2/-0.2 mm

2.1.1.2 Glass size:

Max glass size : 2,000 (width) x 3,660 mm

Min glass size : 150 x 300 mm

2.1.1.3 Standard: EN 12150-1:2000

2.1.1.4 Finish product rate (based on clear float glass): 3.2-3.5mm not less than 90%

4 mm not less than 92%

5 mm and above not less than 95%

.

2.1.1.5 Productivity / process cycle time:

5mm = 15 loads /Hour (cycle)

2.1.2 Bent Glass

2.1.2.1 Glass thickness range :

Tempering: 3.2-3.5 mm with tolerance +0.2/-0.0mm

4-12 mm with tolerance +0.2/- 0.2mm

2.1.2.2 Glass size:

Max. glass size : 2,000 x 1,000 mm(bend)

Min. glass size : 200 x 350 mm (bend)

2.1.2.3 Min. bending radius:

450mm (4-6mm)

1000mm (3.2mm, 3.5mm, 8-10mm)

1200mm (12mm)

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2.1.2.6 Productivity / process cycle time: 5 mm = 28 Loads/ Hour

2.2. Utilities

2.2.1 Installed power:

Heating : 576 kW

Drives : 20 kW

Flat Quenching No.1 : 500 kW (250 kW x2)

Flat Quenching/Cooling No.2 : 250 kW

Bent Quenching : 630 kW (315 kW x2)

Bent Cooling : 22 kW

Total installed power: 1,346kW x 80% ≦ 1,100 kW

Note: The power capacity may be different and should be referring to the actual designing power drawing which will be supplied after signing the contract.

2.2.2 Compressed air (one air tank should be supplied with 0.5M3 at least) :

Volume : 0.6 - 0.8 m^3 /min

Pressure : > 0.7 MPa

2.2.3 Suitable glass sorts:

- Clear float glass (soda lime silicate)
- Coated glasses (Including most kinds of hard coated glass, parts of special soft coated glass, which withstands about temperature 700 ℃)
- Patterned glass
- Tinted glass

2.3 Supply Scope

-- Loading table
-- Heating section (furnace)
-- Formation/Quenching section
-- Cooling section
-- Flat quench section
-- Unloading table
-- Associated electrical and control equipment
-- Control terminal
-- Battery-DC emergency driving system
-- SO2 gas feeding unit
-- Modem with long distance diagnosis system
-- Blower inverter (1x315kW)
-- Blower brackets
-- ABB driving motors (made in China)
-- ABB fans motors (made in China)

2.4 Controlling System

1) The whole control procedure, software of industrial computer and PLC are developed by Shanghai North Glass Technology & Industry Co., Ltd., the owner of all intelligence property right. Shanghai North Glass Technology & Industry Co., Ltd. is responsible for the upgrading of the software system.

2) PLC is SIEMENS S7 product.

3) Industrial computer is EVOC product from Taiwan.

4) Inverters are original MITSUBISHI products or equivalent ones.

5) Optical, Sensor Beam Switch is of OMRON product.

6) Monitor is from PHILIPS.

Flatness

The bow measured the concave side on the four sides and diagonals of the glass shall fulfill the following specification: 4 to 19 mm < = 0.3 %

3. The production capacity and tempered glass quality shall be tested according to the glass types listed in 2.2.3. The maximum and minimum size of glass will be tested also. During the test, the glass will be bent and tempered. Also the mechanical and electrical functions of the plant are inspected.

Tolerances

Deviation of shape	< 3.0 mm
Straightness of the edge	< 3.0 mm / m

Make/Type:	**North Glass / NG-12H3610II (3.2 -19mm/3.2-12mm)**
Group-Subgroup:	9 Tempering-Härtung - Bending and tempering furnaces
Reference:	S-TPB-057
Construction Year:	2005
Condition:	05 Machine as seen and approved - no warranty
Info:	The buyer can come and practice and make tests.
	The furnace includes loading table, heating section, bent

formation/quenching section, flat quenching section, unloading table, blowing & cooling system and control system. It is a reverse operation system which one direction is flat temper glass working way, while the reverse direction is bent temper glass working way. It is used to manufacture flat and cylindrical tempered and heat strengthened glass for architectural, furniture, home appliance, shower-cabin components etc.

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Options: Offered extra: We have on stock the complete set of new ceramic rollers Vesuvius. We have also a lot of spare parts. There are 5 big fans due to tempering 3mm glass. From 4mm glass is neccesary only 1 fan 250 KW.