

Technical Specification for U-shape 35-220KV Vertical Triple-layer Extrusion Dry Cross-linking Cable Production line

Standard: Q/BCSTQ.01-2020

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Appendix 1:

Technical Specification for
Triple-layer Extrusion Dry Cross-linking Cable Production Line

The production line is designed for manufacturing 35~220kV XLPE insulated power cable.

1. Main technical specification

1.1 Voltage Class

XLPE: 35~220kV

1.2 Conductor Size

Cu: 150~2500mm²

Al: 240~2500mm²

1.3 Cable weight: Max.34kg/m

1.4 Cable diameter: Max.119mm

1.5 Cable construction

Conductor shield: 0.6~2mm

Insulation: 4.5~27mm

Insulation shield: 0.6~2mm

Conductor dia.: Φ14.6~Φ56.1mm

1.6 Material:

Conductor: compressed Cu, aluminium stranded conductor, Milliken conductor

Conductor shield: crosslinkable screening material

Insulation: XLPE

Insulation shield: Non-peeling insulation screening material (above 35KV)

1.7 Line speed: 0.2~8m/min

1.8 Line execution: vertical U-shape line

a. Crosslinking tube (Vertical section)

Material: Stainless Steel 304, Φ273mm×4mm

Length: heating section is 36m, 6 sections

Design pressure: 1.6MPa

Temperature range.: 150~450°C

b. Telescopic tube and gyratory chamber

Rotating wheel dia.: Φ3500mm

Design pressure: 1.6MPa

c. Crosslinking cooling tube (Vertical section)

Material: Stainless Steel 304, Φ273mm×4mm

Length: about 96m, 16 sections

d. Thermal relaxation device

Relaxation section: $\Phi 273 \times 4$, 12m long, 2 sections,

Material: Stainless steel 304

1.9 Extruders arrangement:

Extr. $\Phi 80$ mm-Extr. $\Phi 175$ mm-Extr. $\Phi 100$ mm

Extr. $\Phi 80$ mm is for conductor screen

Extr. $\Phi 175$ mm is for cross linked polyethylene(XLPE)

Extr. $\Phi 100$ mm

1.10 Pressurized medium in pipe: nitrogen

1.11 Cooling medium in pipe: Nitrogen or water

1.12 Kinetic energy consumption:

Electricity: installation capacity is 1000kVA

415V \pm 10%, 50Hz \pm 1%, three-phase and four-wire

Compressed air: 0.6~0.8MPa

Air consumption: 0.5m³/min (one moment in time)

Nitrogen: pressure 2.0~2.5MPa, purity 99.5%, consumption 1~2m³/h

It is necessary to prepare 1 nitrogen storage containers no less than 10m³ to start up the line.

2. Main components and technical requirements

2.1 Traveling Pay-off stand

If there is protective tape on the cable conductor surface or for the active pay-off or producing large cross section cable, it can do direct pay-off no via accumulating wheel.

a. Drum diameter: 2000~3150mm, GB4004-84, PN-Type

b. Drum width: 1500~2300mm

c. Drum weight: Max.16t

d. DC drive, Z4 motor, DC drive in four-quadrant

e. Pay-off speed: 0~8m/min

f. Has quick moving function

2.2 Horizontal accumulator

a. Accumulating length: 80m

b. Guide pulley dia.: 2m

c. Driving wheel groove numbers: 3

d. Fixed wheel groove numbers: 4

e. Tension: 300~3200N, adjustable

f. Operation can be separately performed on the accumulator and operating cabinet in master control room, accumulating value is displayed on the control cabinet.

g. In the front and back of the accumulator, there is clamping device for the wire core

h. There is an audible and visual alarm to tell if the accumulator is empty or full, and emergency stop switches of limiting positions can make sure the equipment safe.

2.3 Metering capstan

- a. Pulling way: disk type capstan
- b. Pulling wheel dia.: 3000mm
- c. Adjustable range: 0.2~8m/min, with four gear-shifts
- d. Pulling force (max): 40kN
- e. Cable diameter (max): 70mm
- f. A speed sensor equipped with a line speed meter
- g. To make sure different specifications of core be aligned to the head center when it is out of from metering capstan, this machine can move 100mm to left or right as the wheel axle direction.
- h. Main drive adopts DC motor, which can run in 4 quadrants, it is constant tension control.

2.4 Conductor preheater

3 sets of heating coils (to be purchased by customers)

Preheater length is no more than 1m, heating power is adjustable, temperature measured and regulated by manual

Preheating temperature: Cu conductor: 80~120°C, Al conductor: 80~120°C

2.5 Extruder 80/20D

a. Barrel

Material: 38CrMoAlA

Hardness: 900HV

Working pressure: max.70MPa

b. Screw:

Material: 38CrMoAlA

Hardness: 850HV

Type: BM-type cooling at the center hole

Rate of rotation (max): 46.5rpm

c. Gear box

Reduction gear ratio: 32: 1

Lubricating method: inject oil from oil-pump

Dynamic bearing force 1000kN

d. Heating and cooling system

Heating way for barrel: electric heating

Cooling way for barrel: oil or water cooling

Cooling way for feed hopper: water cooling

Quantity of heating section for barrel: 4

Heating power for each heating section: 3kW(cast aluminum)

Barrel cooling principle: Adopt independent fully enclosed oil cooling way (inclu.

Circulating pump, heat exchanger, valve and water controlled system)

- e. DC motor
 - Type: Z4
 - Power: 55kW
 - Rated speed: 1500rpm
- f. Material feeding: automatic vacuum feeding and dry, stainless steel hopper
- g. Extrusion output: 60 L/h
- h. Barrel temperature control
 - Primary instrument: Thermocouple E, Secondary figure meter:digital display, regulated by PID, mounted in control cabinet
 - Control accuracy: $\pm 1^{\circ}\text{C}$
- i. Pressure control: by a melt pressure measuring sensor installed before the filter screen at the end of barrel, there is a digital display for pressure on the electric cabinet. When overpressure occurs, it will take measure to protect the extruders

2.6 Extruder 100/20D

- a. Barrel
 - Material: 38CrMoAlA
 - Hardness: 900HV
 - Working pressure: max 70MPa
- b. Screw
 - Material: 38CrMoAlA
 - Hardness: 850HV
 - Diameter: 100mm
 - Type: BM-type cooling at the center hole
 - Rate of rotation: max.: 41.5rpm
- c. Gear box
 - Reduction gear ratio: 36:1
 - Reduction gear ratio: inject oil from oil-pump
 - Maximum pressure for thrust bearing: 1040kN
- d. Heating and cooling system
 - Heating way for barrel: electric heating
 - Cooling way for barrel: oil or water cooling
 - Cooling way for feed hopper: water cooling
 - Quantity of heating section for barrel: 4
 - Heating power for each heating section: 4Kw
 - Barrel cooling principle: Adopt independent fully enclosed oil cooling way (inclu. a pump, heat exchanger, valve and water controlled system)
- e. D C motor
 - Type: Z4
 - Power: 75kW

Rated speed: 1500rpm

Drive: Parker 590

f. Material feeding: automatic vacuum feeding, stainless steel hopper

g. Extrusion output: 100 L/h

h. Barrel temperature control:

Primary instrument: Thermocouple E

Secondary figure meter: digital display, regulated by PID, mounted in control cabinet

Control accuracy: $\pm 1^{\circ}\text{C}$

i. Pressure control: by a melt pressure measuring sensor installed before the filter screen at the end of barrel, there is a digital display for pressure on the electric cabinet. When overpressure occurs, it will take measures to protect the extruders.

2.7 Extruder 175/25D

a. Barrel

Material: 38CrMoAlA

Hardness: 900HV

Working pressure: max.50MPa

b. Screw

Material: 38CrMoAlA

Hardness: 850HV

Diameter: 175mm

Type: barrier type cooling at the center hole

Rate of rotation: Max.32rpm

c. Gear box:

Reduction gear ratio: 44.8: 1

Lubricating method: inject oil from oil-pump

Maximum pressure of thrust bearing 1600kN

d. Heating and cooling system

Heating way for barrel: electric heating

Cooling way for barrel: oil or water cooling

Cooling way for feed hopper: water cooling

Cooling way for gearbox: water cooling

Quantity of heating section for barrel: 7

Heating power for each heating section: 5kW

Barrel cooling principle: Adopt independent fully enclosed oil cooling way (inclu. a pump, heat exchanger, valve and water controlled system)

e. D C motor

Type: Z4

Power: 185kW

Rated speed: 1500rpm

Drive: PARKER 590

f. Material feeding: auxiliary hopper, stainless steel hopper, automatic vacuum feeding

g. Extrusion output: 350 L/h

h. Temperature control for barrel

Primary instrument: Thermocouple E

Secondary figure meter: digital display, regulated by PID, mounted in control cabinet

Control accuracy: $\pm 1^{\circ}\text{C}$

i. Pressure control

By a melt pressure measuring sensor installed before the filter screen at the end of barrel, there is a digital display for pressure on the electric cabinet. When overpressure occurs, it will take measures to protect the extruder.

2.8 Triple-layer extrusion crosshead

a. Technical parameters

Conductor diameter range: 14.6~45.3mm

Outlet wire diameter: max. 119mm

Extrusion thickness:

First layer: 0.6~2.0mm

Second layer: 10.5~27mm(32mm)

Third layer: 0.6~2.0mm

b. Heating way: with oil or water, Temperature control accuracy: $\pm 2^{\circ}\text{C}$

2.9 Splice box

a. Material: Telescopic tube is made of stainless steel 304

b. Travelling length: 1000mm

c. Action way: Hydraulic

As the pressure in the tube is interlink, for security the tube can be opened only when the pressure goes back to zero position.

2.10 Heating way for cross linking tube

a. Thermometer is mounted on the cabinet, and temperature control accuracy is $\pm 5^{\circ}\text{C}$

b. Heating temperature: Max. 450°C

2.11 Cooling section (vertical section)

Material: stainless steel 304, pipe size: $\phi 273 \times 4$

Cooling medium: Nitrogen

2.12 Gyrotory chamber

Telescopic tube is about 800mm long

Wheel dia.: $\Phi 3500\text{mm}$

Design pressure: 1.6MPa

It's easy to operate, and conforms to pressure vessel standard.

2.13 Thermal relaxation device

Relaxation section $\Phi 273 \times 4$, Stainless steel 304, Length :12m

Heating way is short circuit heating, and heat even.

2.14 End seal

a. Operating way: by pneumatic

b. Sealing way: primary seal and secondary seal, these two ways.

c. Features: Sealing the pressure in the pipe by regulating the screw to make the seal ring have deformation, so that it can prevent pipe from air leakage.

2.15 Pull-out capstan (disk type)

a. Pulling cable dia. (max): 150mm

b. Pulling force (max): 40kN

c. Pulling wheel dia.: $\Phi 3000$ mm

d. Speed regulating range: 0.2~8m/min

e. Main drive adopts DC motor, can run in 4 quarants

2.16 Auxiliary caterpillar

a. Pulling cable diameter (max.): 150mm

b. Pulling force (max): 20kN

c. Clamping length: 1750mm

d. Clamping cylinder group nos.: 7+1

e. DC drive

2.17 Traveling Take-up stand

a. Drum dia: 2000~4200mm, GB4004-84 PN

b. Drum width: 1500~2500mm

c. Maximum bearing capacity: 18t

d. DC Drive, four quarants

e. Take-up speed: 0~8m/min

f. Has the function of quick travel

g. Traversing range: $\Phi 30 \sim 150$ mm

2.18 Nitrogen supply and discharge

a. Pressure of nitrogen supply source: not more than 2.0MPa, make sure of enough nitrogen storage before set up.

b. Nitrogen is supplied automatically or by hand. Under the automatic state, the pressure is controlled automatically by regulating valve.

c. There is a pressure gauge on the splice box to watch system pressure. When the pressure is going beyond the stipulated value, the system will alarm or close the nitrogen supply valve.

d. There is a pollutant nitrogen discharging system. There is a display for the magnetic valve discharge on the main control cabinet. Pollutant nitrogen discharge is 1~2m³/h

e. There is a suction pump, it will be opened when machine is stopped, which prevents the air in pipes from entering main machine hall.

2.19 Water circulating cooling

- a. Bodies of three extruders are cooled with oil or water in the independent enclosed circuit. The water should be softened water.
- b. Working pressure range should be 0.2~0.8MPa, automatically regulated. Water will be supplied by customer factory according to the actual situation.
- c. Crosslinking tube adopts nitrogen cooling. When nitrogen is cooling, the heat exchanger of fan forms a circulating cooling system with the cooling pipeline. When the machine stops the crosslinking tube will be cooled by air cooling device of the crosslinking heating tube.
- d. Cooling circle zone is controlled by pneumatic ball valve.
- e. When working, all interfaces that make displacement with crosslinking pipes are stainless steel hose.

2.20 Electrical control

- a. When the system is running, the whole line is based on the metering capstan. Catenary controller is acted as auxiliary adjustment to make sure the whole line run synchronously.
- b. All the electrical drive systems can realize synchronously speed up and down, also can be separately controlled by single machine. It has the function of whole line reversal.
- c. In the whole line there are five emergency stops respectively in pay offs, accumulators, main operating station, end seal and take-ups.

d. Cabinet display

Whole line layout, running situation, voltage (rotate speed) and current of DC drive
Temperature at every point for measuring temperature of heating temperature control system for extruders and vulcanizing tube

Line speed

Melt pressure of three extruders

Cable position

Accumulating quantity

Meter counting

Pipe pressure display

Nitrogen storage amount (pressure) display

e. Acoustic-optical alarm system

Overpressure alarm for melt pressure of barrel on extruder

Water level high or low, and over-temperature for crosslinking pipe

Alarm of over-pressure for nitrogen, crosslinking pipe alarm

Accumulator empty or full alarm

Oil or water pump stop alarm

f. Electrical control cabinet operation

Switch on by electrical or manual

Start-stop operation on transmission, temperature control and water pump for every unit

Single machine of transmission cabinet up and down adjustment, speed control for the whole line

Set cable position in the vulcanizing pipe (upward or downward adjustment)

Automatic or manual operation for nitrogen supply system, discharge amount adjustment of nitrogen waste (when discharging liquid, it should conform to the standard of state environmental protection)

Automatic or manual control for water level

Clamp and loosen operation before the accumulator

Start the heating system and setting the temperature

g. Electrical control cabinets consist of:

Electrical control cabinets in the main unit room consist of:

Power supply cabinet for in-wire

Power supply cabinet for out-wire

Drive cabinet for extruders

Temperature control cabinet for extruders

Temperature control cabinet for crosslinking pipe heating

Drive cabinet for haul-off

Main control cabinet

Ambient temperature in the main unit room: 0~30°C

For the main control room on the third floor, it should be sufficiently considered that there should be enough space for the electrical cabinet operating and maintenance when do the whole line equipment layout. (meanwhile, should consider the second line electrical cabinet installation), so that it can supply a reasonable design space for making isolating operating room.

2.21 TV supervisory system

4 color telecameras are respectively installed at pay off, take-up, end seal, accumulator and an industrial monitoring station is installed in the main machine hall. (4-picture separator)

2.22 Inspection and acceptance of production line

For the production line commissioning, first perform idle running test, after the test is passed and both parties think everything is OK, trial production inspection and acceptance can be conducted. In most cases, there are three specifications of big, medium and small size, specific sizes are as follows. Supplier offers Die-tools. Specific specification can be seen in the following table. Customer can change the

cable variety according to the sales status, but the die-tool is ready by customer. The extruder extrusion output will be accepted by both parties together.

No.	Specification	Voltage	Quantity
1	150 mm ² Cu	35KV	Continuously start machine at a time
2	630 mm ² Cu	110KV	Continuously start machine at a time
3	1200 mm ² Cu	220KV	Continuously start machine at a time

The cross linking cable 150mm²—35kV & 630mm²—110kV from the production line should meet relevant performance requirements of GB/T 12706 –2002 and GB/T 11017 –2002 standard. The cross linking cable 2000mm²—220kV from the production line should meet the configuration clause in the above mentioned standard.

It will be regarded as the inspection and acceptance of production line after the three specifications of cable from trial production line reach the standard.

2.23 Automatic curing technology control system

A. Automatic curing technology control system adopts S7-400 large PLC of German Siemens Company. Human-machine interface is Siemens color touch screen (12 inch screen). Monitoring control of computer adopts Siemens protocol runtime software. Main operation is equipped with operation buttons and simulation display screen for production line which is intuitive to control and convenient to operate.

Software package

According to curing technology characteristic, software system separates product process into five stages of preheat—start—produce—slow—end. The cable produced from achieving start temperature to slow temperature is regular product, and the process offal is modicum as start up and stop the machine. When start up machine and regulate it, you can pre-heat the tube to shorten the time from room temperature to starting temperature and reduce the start offal. $\text{offal length} \approx \text{start speed} * (\text{start temperature} - \text{preheat temperature}) / \text{ramp upswing speed of temperature}$. For example: preheat 150 degrees; starting temperature 270 degrees; start speed 2 meters ; temperature ramp upswing speed set at 8 degrees per minute; $\text{offal length} \approx 2 * (270 - 150) / 8 = 30\text{m}$. The produced cable after you push stop button is waste. $\text{Waste length} \approx \text{ending speed} * (\text{ending curing time} + \text{ending cooling time})$. For example, ending speed is 0.1m; ending curing time is 25 minutes ; ending cooling time is 45 minutes; $\text{waste length} \approx 0.1 * (25 + 45) = 7\text{m}$. The products could be divided into the automatic synchronization and manual synchronization. In automatic synchronization condition, tube temperature upswing and descent will be controlled according to rate of system setting (operator could modify the rate). In manual synchronization state, the operator could set tube

temperature by hand. Whether it is automatic synchronization or manual synchronization, the line speed will track automatically come after the tube's actuality temperature, so the quality of products will not be influenced by human factor. The percent of pass of wire and cable will increase quickly, and realize few operators to work. It also can improve the production efficiency and cut down the production cost. The monitoring control system protocol runtime adopt network structure of opening type. It can transmit real time or history date to management network of branch or other departments so that realize system resource sharing in network.

Functions and characteristic of system

- a. Detecting and handling function: It will detect and handle with linearization to the temperature of pipe, extrusion, pressure, revolution of screw, capstan line speed, motor current parameter and so on, and collect state of performing component on line.
- b. Closed loop control function: there is a PID control function about automatic curing temperature, It will control line speed in different type cable curing process when it could complete automatic transformation of tube temperature.
- c. The graphics function: It shows every unit state, production specification, type and cable's length of single unit with parameter table, process chart, running graft, bar diagram.
- d. Record function: to record line temperature and pressure parameter with fashion of parameter list and curve.
- e. On-line adjustment function: As system running, after engineering technical personnel enter the password, you can modify instrument range, alarm limit, specification and type of cable, curing tube temperature and other running parameter on curing.
- f. Print function: it could print running class diagram and day diagram of line definite time.
- g. Alarm regulation: when the temperature, pressure, curing time and so on parameter surpass the limit, it will send out alarm, and record and converse the alarming message.
- h. History inquiry function: According to requirement of curing running, it will record history date and be on file with curing process parameter, curve and status in a certain interval according to running time (year/month/ day/ time/ minute/second). It is easy to inquiry and trace the product quality.
- i. Make sure the system safe: provide password for system safety, and prescript the visiting right. It only allows to operate own interface, alarm spot and date, to prevent operator from exceeding authority to operate.
- j. Good human machine interface: Chinese operating interface. Easy to operate and master. There is a random on-line help to make it easy to learn and train.

Temperature control system

A、 hardware :

Control and acquisition of each kind signal by SIEMENS S7-300 series module.

Error range between actual temperature and display temperature on touch screen in each temperature measure point when normally startup and running stably:

extruder: $\pm 2^{\circ}\text{C}$

curing tube: $\pm 3^{\circ}\text{C}$

B、 software :

With SIEMENS STEP7 program software, PID operation, output by I/O point, control heating、 cooling solid relay.

C、 control :

With SIEMENS 400 series large CPU, more bigger memory capacity of program, more fast operation speed, simultaneously processing much more and more complicated data, better accuracy.

Catenary control system

With high field type receiving theory, cancel failing of electromagnetic induction type control, measure more accurate, stably, with shift fit function. Adapt disturbance of conductor preheater and AC drive.

Synchro drive control

Transport control with Eurotherm SSD-590P+1000 line rotary encoder, guarantee error $\leq 1\text{r/m}$ between motor rev and set value.

Touch screen menu function :

1)、 Summarize :

Lenovo desktop computer, SIEMENS color multifunctional 12" touch screen.

Program software with PROTOOL language Chinese programming, human machine interface interaction, menu type input, clear intuitive.

Electric control system of 1 set VCV line consist of 4 sets of TV monitors, 1 color touch screen. Set main operation plate, temperature control and melt pressure secondary

gauge, button, indication light on system.

With touch screen operation system and computer operation system, more safety and stably.

With normal switch on main control cabinet, more convenient and quick to use.

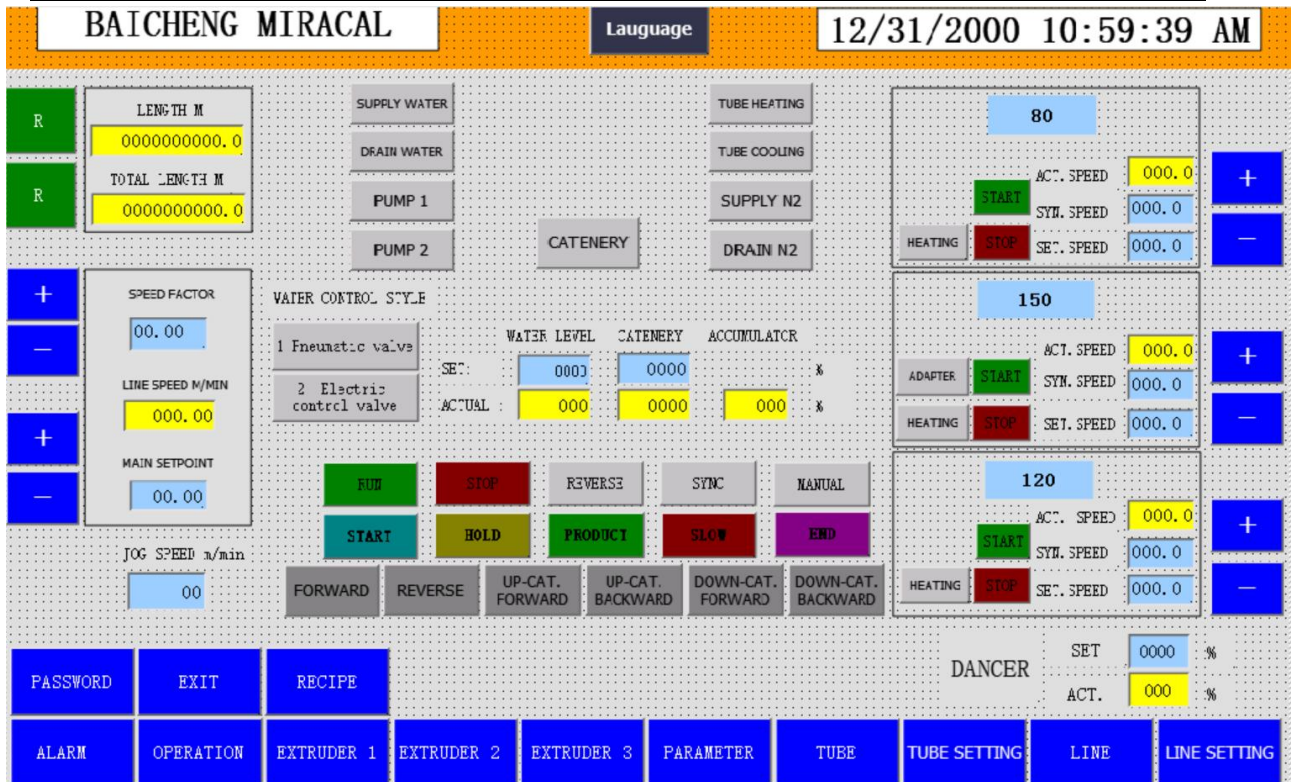
Front view of Main control cabinet plate



Set total line flow diagram, LED display, clear.

2)、touch screen view instruction :

A、“main view”instruction :



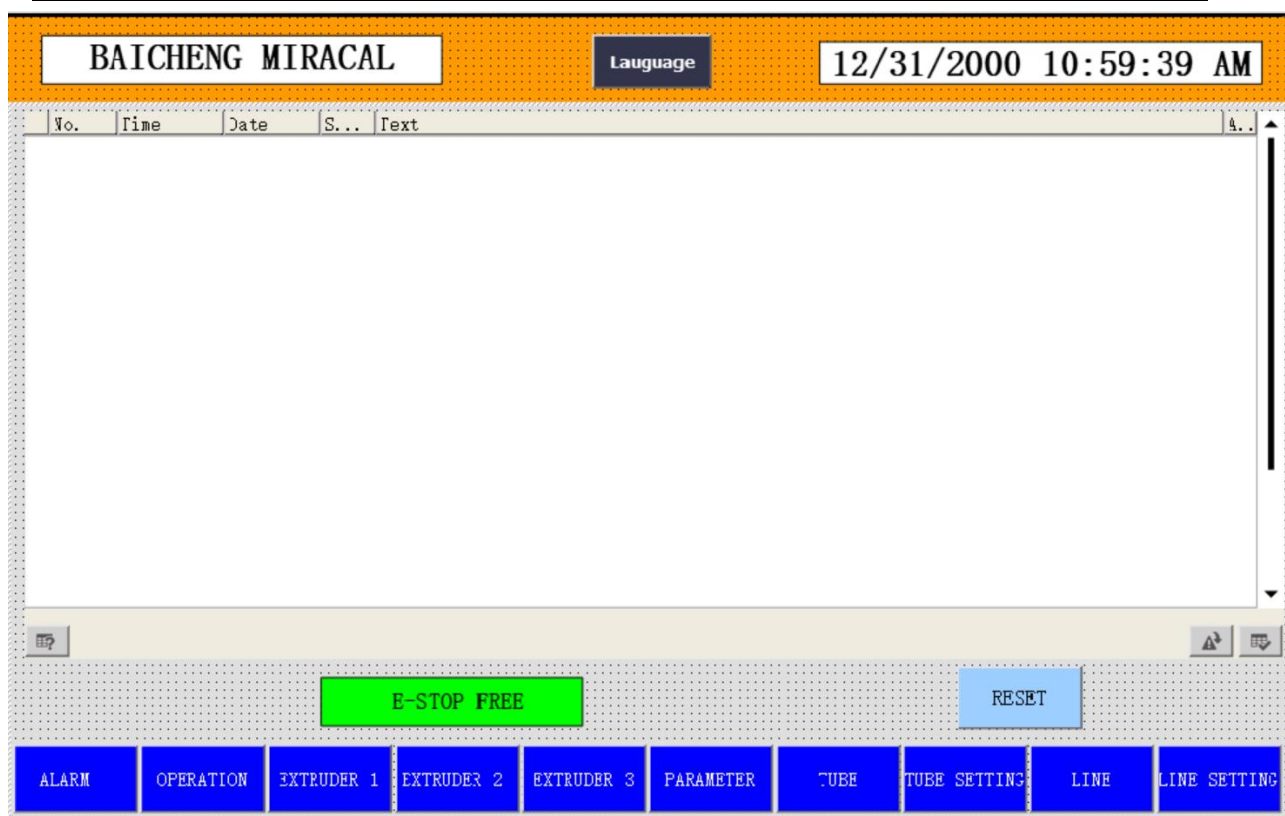
Display content as below:

- 1>、line speed, latest alarm, counting length;
- 2>、3 extruders heating, startup, synchro rev, single machine rev and actual rev;
- 3>、setting line speed, actual line speed, setting line speed factor;
- 4>、accumulating quantity percentage;
- 5>、catenary status, water level status;
- 6>、total operation button;
- 7>、alarm prompt latest failure, search failure site;
- 8>、control up helper caterpillar and down one;

B、“alarm”split view :

Display content as below:

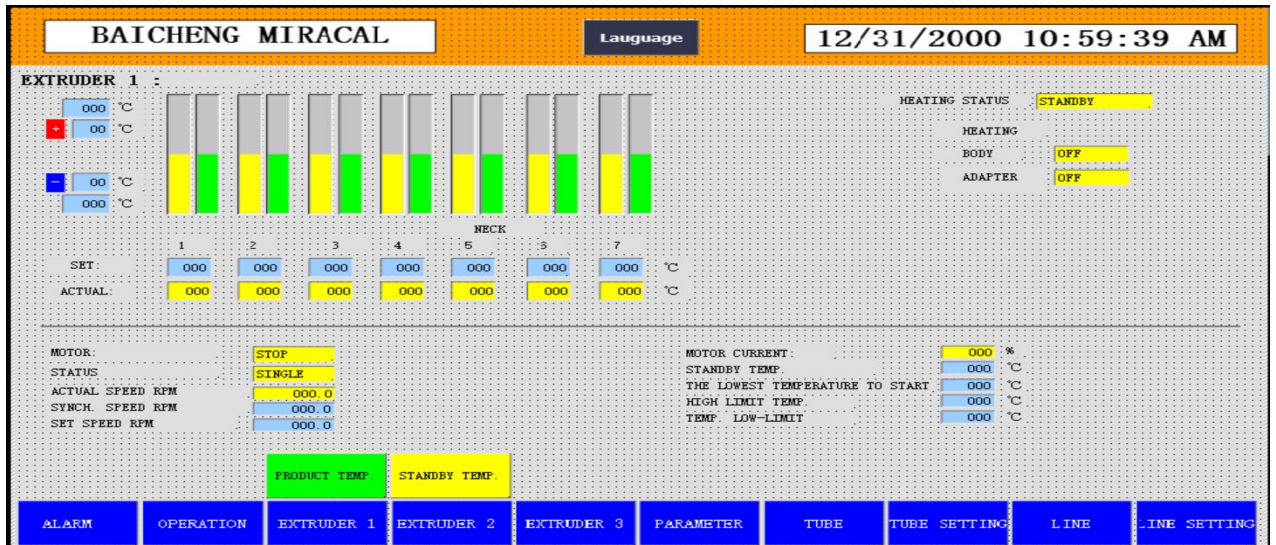
- 1>、current alarm status and emergency stop status;
- 2>、set emergency stop reposition button;



C、“extruder”split view (3 extruders in seperate view) :

Display content as below:

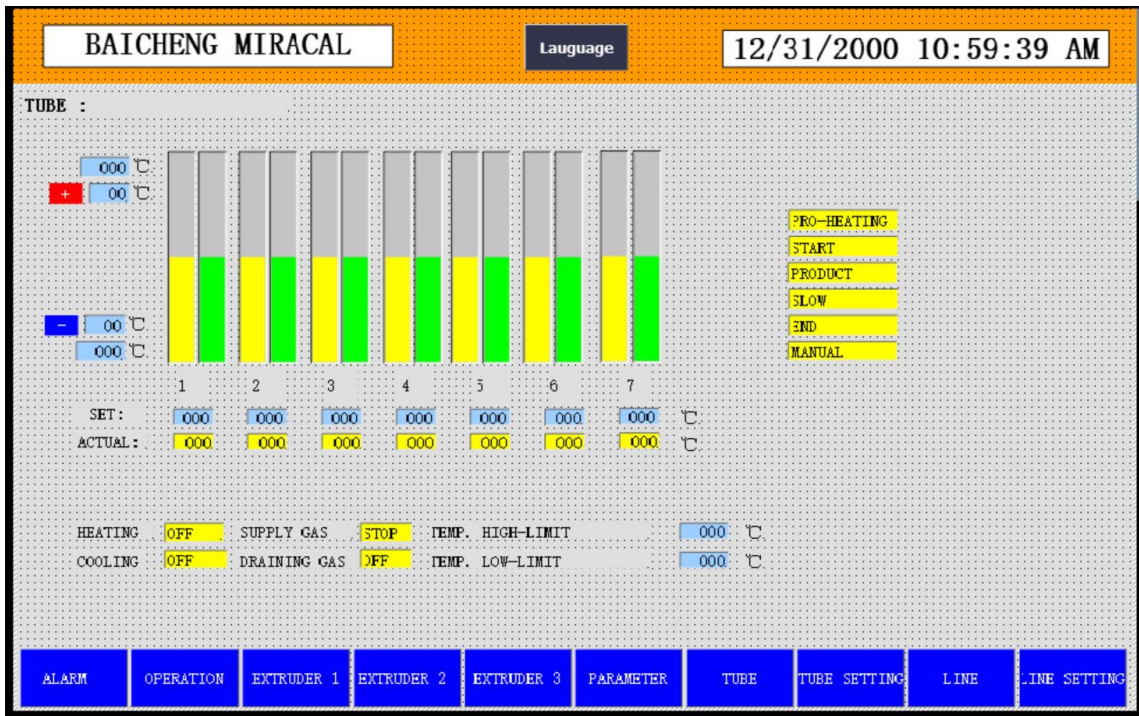
- 1>、 main motor status and running mode ;
- 2>、 screw rev and current ;
- 3>、 heating status ;
- 4>、 each heating area status, actual measure temperature, set temperature ;
- 5>、 standby temperature, save power ;
- 6>、 high low limit alarm ;
- 7>、 min startup temperature, protect device.



D、“curing tube”split view :

Display content as below:

- 1>、running status mode of line ;
- 2>、air providing status ;
- 3>、heating status ;
- 4>、each heating ares status, actual measure temperature, set temperature ;
- 5>、high low limit alarm ;



E、“extruder PID set”split view (3 extruders in separate view) :

Display content as below:

- 1>、PID set each area temperature control in extruder ;
- 2>、heating and cooling control status ;
- 3>、compensation regulate measure temperature offset in extruder ;

BAICHENG MIRACAL							Language	12/31/2000 10:59:39 AM					
EXTRUDER 1 PID CONTROL							TEMPERATURE			TEMP. HEAD			
	1	2	3	4	5	6	7	80	150	120	1	2	
SET:	000	000	000	000	000	000	000						
ACTUAL	000	000	000	000	000	000	000	000	000	000	000	000	
HEATING %	000	000	000	000	000	000	000						
COOLING %	000	000	000	000									
1/SP	00.0	00.0	00.0	00.0	00.0	00.0	00.0						
1/KP	00.0	00.0	00.0	00.0									
TI	000	000	000	000	000	000	000						
TI	000	000	000	000									
TD	000	000	000	000	000	000	000						
TD	000	000	000	000									
TEMP. OFFSET	000	000	000	000	000	000	000	000	000	000	000	000	
			EXT. 1 PID	EXT. 2 PID	EXTRUDER 3 PI	OTHER PID	TUBE PID						
ALARM	OPERATION	EXTRUDER 1	EXTRUDER 2	EXTRUDER 3	PARAMETER	TUBE	TUBE SETTING	LINE	LINE SETTING				

F、“curing tube PID set”split view :

Display content as below:

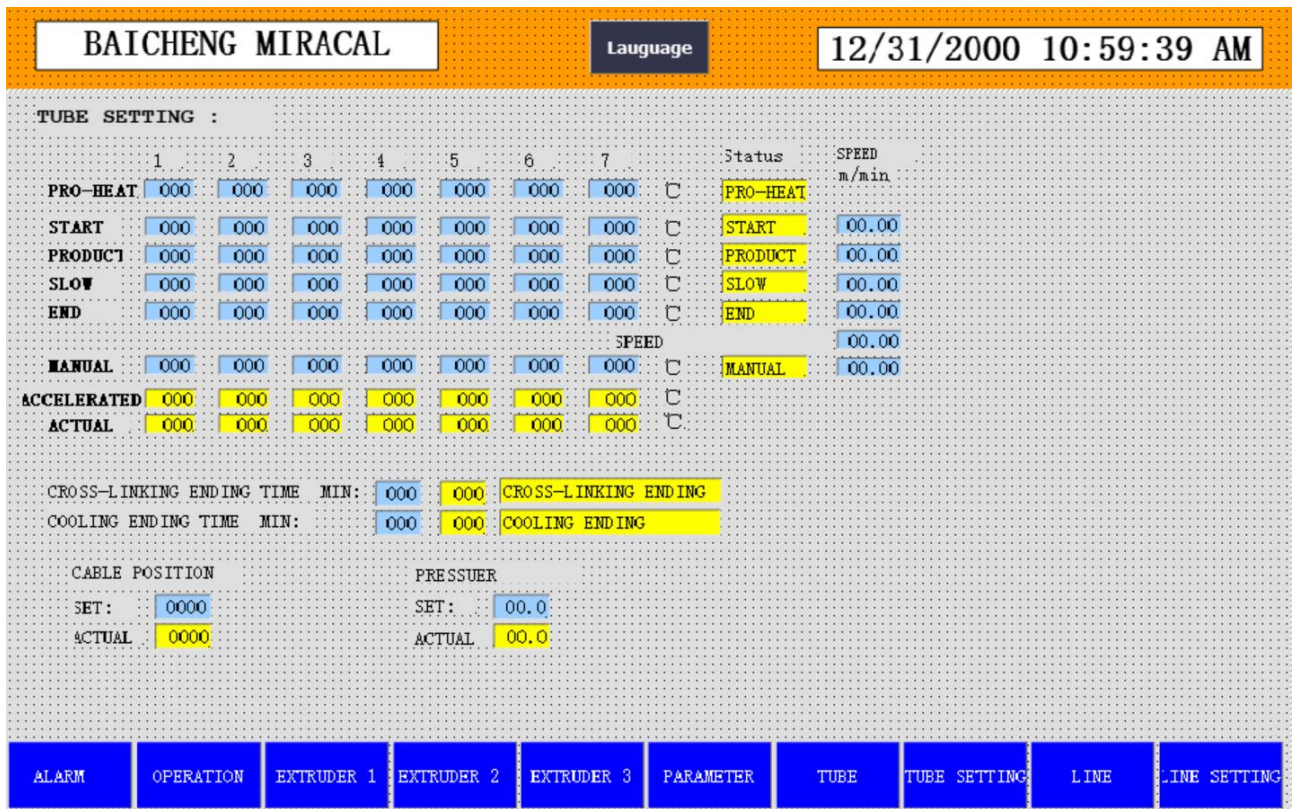
- 1>、PID set temperature control each area in tube ;
- 2>、heating and cooling control status ;
- 3>、compensation regulate measure temperature offset in tube ;

BAICHENG MIRACAL		Language		12/31/2000 10:59:39 AM			
TUBE PID CONTROL:							
	1	2	3	4	5	6	7
SET:	000	000	000	000	000	000	000
ACTUAL	00000	00000	00000	00000	00000	00000	00000
HEATING	000	000	000	000	000	000	000
COOLING	000	000	000	000	000	000	000
1/KP	00.0	00.0	00.0	00.0	00.0	00.0	00.0
1/KP	00.0	00.0	00.0	00.0	00.0	00.0	00.0
TI	000	000	000	000	000	000	000
TI	000	000	000	000	000	000	000
TD	000	000	000	000	000	000	000
TD	000	000	000	000	000	000	000
TEMP. OFFSET	000	000	000	000	000	000	000
		EXT. 1 PID	EXT. 2 PID	EXT. 3 PID	OTHER PID	TUBE PID	
ALARM	OPERATION	EXTRUDER 1	EXTRUDER 2	EXTRUDER 3	PARAMETER	TUBE	TUBE SETTING
							LINE
							LINE SETTING

G、“curing tube set”split view :

Display content as below:

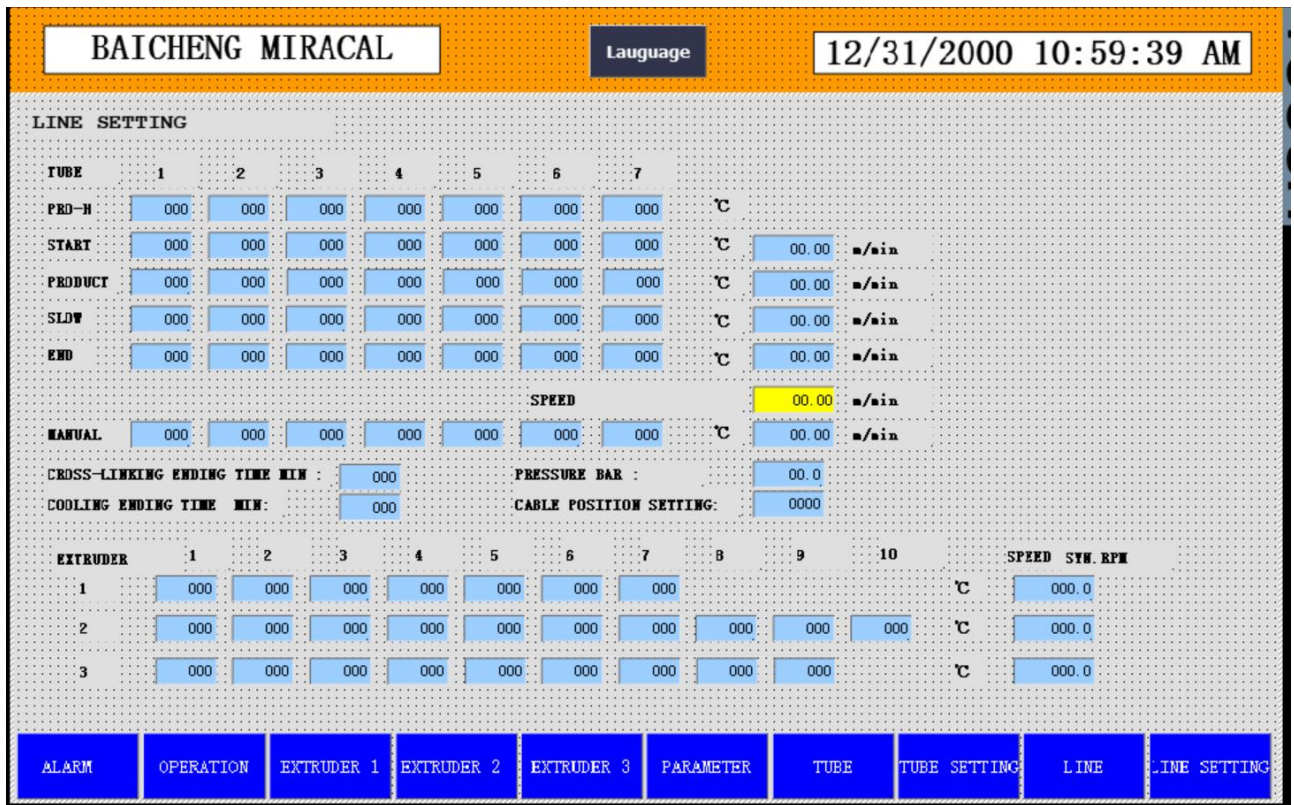
- 1>、temperature set in each running phase of each area ;
- 2>、running mode status of line ;
- 3>、line speed set in each producing mode and current speed ;
- 4>、curing complete phase time set and remaining time ;
- 5>、cooling phase time set and remaining time ;
- 6>、temperature in tube heating process ;



H、“line set”split view :

Display content as below:

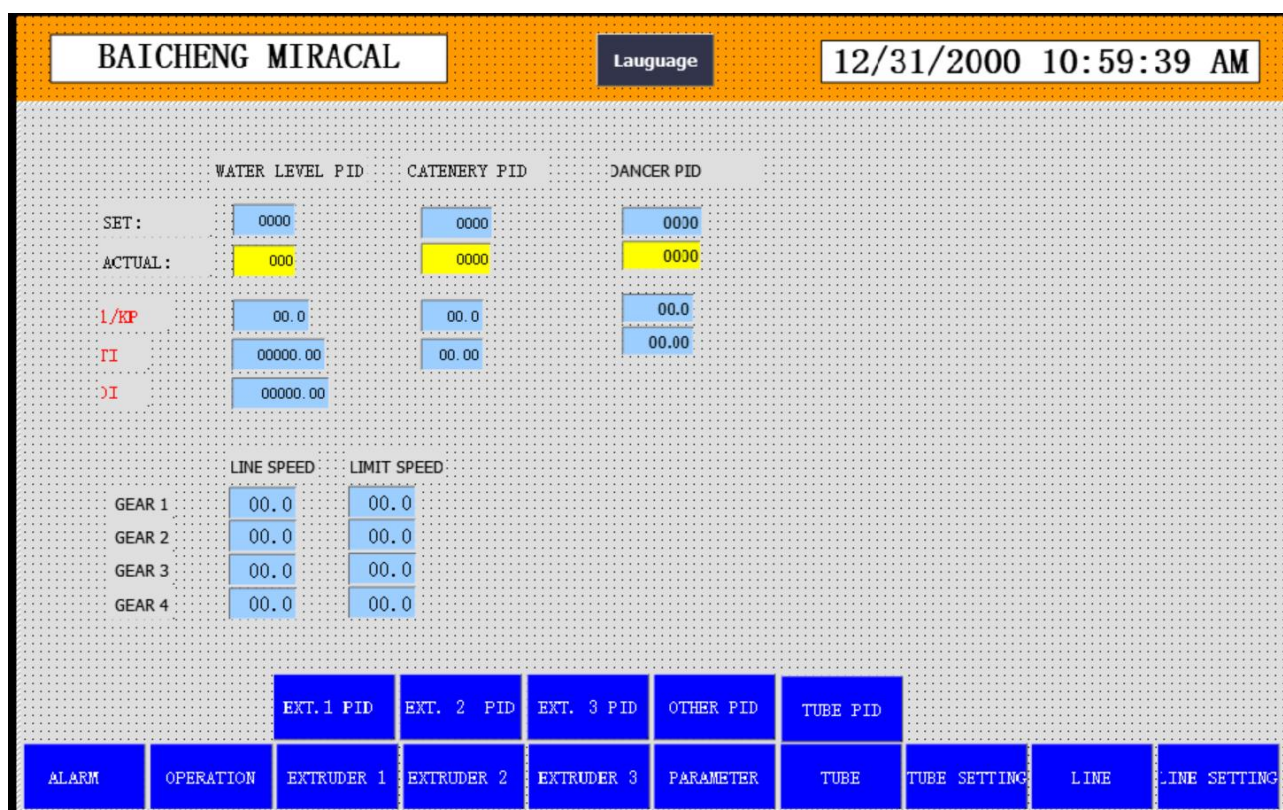
- 1>、line speed in every producing mode ;
- 2>、set temperature of extruder and tube ;
- 3>、extruder synchro rev ;



I、“other PID”split view :

Display content as below:

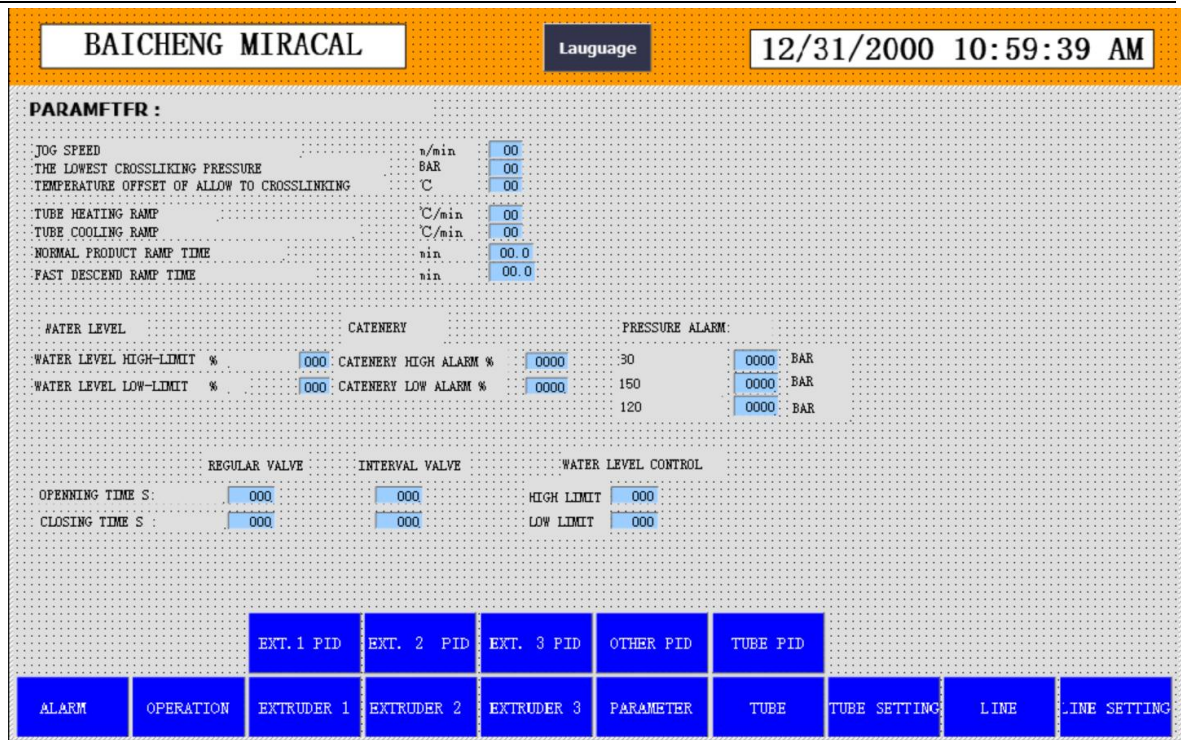
- 1>、PID set water level、catenary controller、metering capstan and caterpillar ;
- 2>、separate set and actual valve ;



J、“technical parameter”split view

Display content as below:

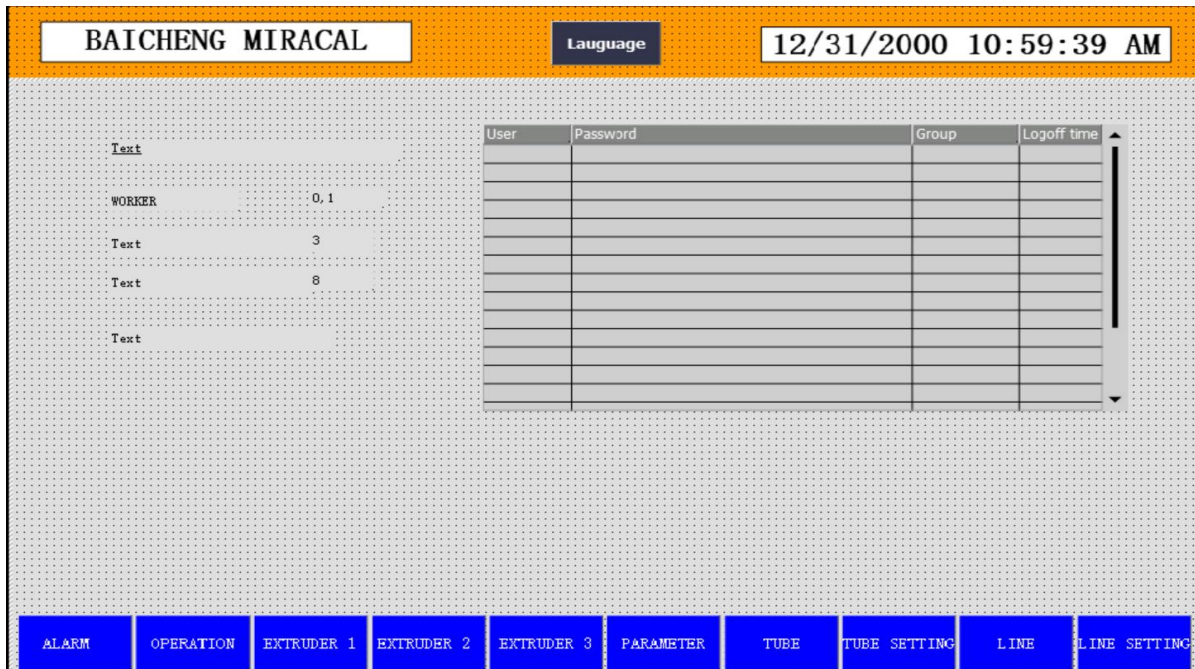
- 1>、 set water level and melt pressure alarm limit of catenary controller ;
- 2>、 set open close time of each automatic magnetic valve ;
- 3>、 set each parameter of automatic curing ;

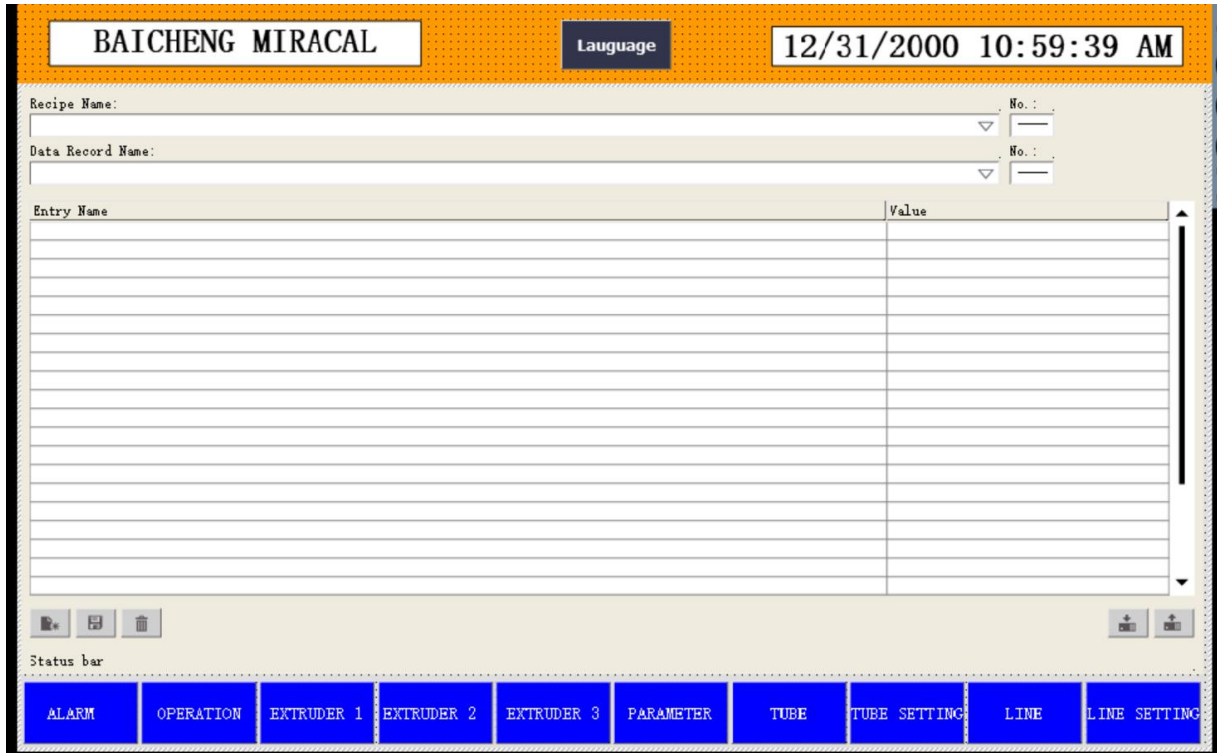


K、“password management”split view

Display content as below:

1>、set and manage user`s each grade password ;





N、“curve”split view :

Sampling in setting time, draw curve by portray point graphics in increase decrease speed process of 3 extruders, metering capstan and caterpillar.

Guarantee to high efficiency PID regulate upto setting temperature in min increase temperature process by record, portray, observe the increase temperature curve in each curing tube. Efficiently overcome thermal inertia, overshoot min and promptly attenuate.

O、“print”split view

Connect printer or CD reorder, can memory parameter in cable producing process.

P、line with synchro increase decrease speed, total line reverse and single machine regulate function.

Appendix 2 :

Main Equipments List

Item	Name of equipment	Specification	Quantity
1	Pay-off stand	Φ 3150 mm (portal travelling type) with guiding rails	1 Piece
2	Tension regulator		1 Piece
3	Steering wheel group		1 Piece
4	Wire clamber	Pneumatic type	1 Piece
5	Accumulator	Wheel dia. 2000mm, Accumulating length: 80m	1 Piece
6	Steering wheel group		1 Piece
7	Metering capstan	Pulling force: 40KN	1 Piece
8	Triple extrusion crosshead	With 1 set of crosshead disassembling tool, 1 Stand of crosshead and stainless steel hose	1 Piece
9	Heater of crosshead	Oil heater	3 Pcs.
10	Φ 80 extruder	L:D 1:20, including bottom moving stand, guiding hose with crosshead	1 Piece
11	φ 175 extruder	L:D 1:25, including bottom moving stand, guiding hose with crosshead	1 Piece
12	Φ 100 extruder	L:D 1:20, including bottom moving stand, guiding hose with crosshead	1 Piece
13	Material feeding device for extruders	3 hoppers (including 2 dryers), 3 vacuum loaders	1 Set
14	Barrel cooling	Incl. water box, pump and heat exchanger	1 Set
15	Splice box	Hydraulic	1 Piece

16	Cross linking heating tube	$\phi 273 \times 4$ stainless steel, including tube supporting wheel	6 Sections
17	Copper and aluminum bar	Short circuit heating	1 Set
	Short circuit transformer		1 Set.
18	Gyratory chamber	Wheel dia. : $\Phi 3500\text{mm}$	1 Piece
19	Vertical cooling section (first zone)	$\Phi 273 \times 4$, Stainless steel 304, 8sections	1 Set
20	Vertical cooling section (second zone)	$\Phi 273 \times 4$, Stainless steel 304, 8 sections	1 Set
21	Thermal relaxation section	$\Phi 273 \times 4$, Stainless steel 304, 2 sections	1 Set
22	Control system for nitrogen pressure		1 Set
23	Nitrogen circulating system	Heat exchanger, circulating fan (to be used for curing of the first section)	1 Set
24	Nitrogen drain system	Incl. nitrogen induced air system	1 Set
	Pollutant nitrogen discharge tube		1 Section
25	Air pipe control system		1 Set
26	Water control system	Automatic and manual control valve, differential pressure transmitter	1 Set
27	End seal	Soft seal, pneumatic control, stainless steel	1 Piece
28	Meter counter	Mechanical type	1 Piece
29	Pull-out caterpillar	Pulling force: 40kN	1 Piece
30	Auxiliary caterpillar	Pulling force: 20kN	1 Piece
31	Take-up stand	$\Phi 4200\text{mm}$ (mobile type), with guiding rails	1 Piece
32	Electrical control cabinet	Touch Screen operation	1 Set
33	Industrial Camera	Colorful	4 Pcs.
34	TV monitor	32" LCD	1 Piece
35	Tools and accessories	A set of disassembling tool for $\phi 80$ extruder screw, a set of disassembling tool	1 Set

		for ϕ 175 extruder screw and a set of disassembling tool for ϕ 100 extruder screw	
36	Dies for test run		1 Set
37	Tool carriage		1 Piece
38	Rubber cushion for end seal		10 Pcs.
39	Hydraulic splicer	Whole set of dies	1 Set
40	Ex-factory Documents	Total line operating instructions, single machine manuals, single machine drawing, die drawing, VCV layout, foundation drawing, electric diagram, outer wiring diagram, gauge instruction, statistical table of installation cable, drawing of customer-making part	1 lot

Attachment 3: Auxiliary equipment part that buyer shall prepare and provide

Item	Name of equipment	Quantity	Unit price	Remark
1	Nitrogen generator 20m ³ /h	1 (Set)		
2	Connecting tube of gas and water pipe, installation materials	1(Set)		
3	Wire and cable for installation	1(Set)		
4	Cable support ladder on curing tube	1(Set)		
5	Stand of metering capstan	1(Set)		
6	Pipe Supporting part under slide point of curing tubes	1(Set)		
7	Platform of Catenary controller	1(Set)		
8	Pipe bracket and platform of transformer	1(Set)		
9	The PD and AC high voltage test and PD fault location Test System for XLPE Cable	1(Set)		
10	SIKORA DEVICE X-RAY8000NXT	1(Set)		
11	Conductor preheating device (3 sets of heating coils)	1(piece)		

12	Tube insulating and outer packing material	1(Set)		
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Baicheng Miracle Equipment Machinery Co., Ltd.