

Customer: SADAFGAM DELIJAN

Project No.: IR20221206

## 8 Positions Polyester POY Spinning Machine

Technical offer

ZCHTC CHINA

Dec 06<sup>th</sup>, 2022

### **Appendix 1: Design basis**

This project is a production line for spinning 75~150D,150~300D PET-POY from flakes and virgin chips, equipped with advanced automatic winder, with our professional experience in the chemical fiber engineering, which can provide customer with high quality POY.

1.1 Main spec. of production line:

Table 1-1

Line	Denier	Filament	Position	End/pos.	Typical product
P1	POY 125D-250D (DTY 75D-150D)	24~96F	4 pos.	12	150D/48F
P2	POY 250D-500D (DTY150D-300D)	48~288F	4 pos.	12	300D/96F

Note: Final DTY:  $1.0 < dpf < 4.0$

## 1.2 Capacity:

Table 1-2

Line	Denier Range	Position	End/pos.	Process Speed	Capacity (T/D)	
					MIN.	MAX.
P1	POY 125D-250D (DTY 75D-150D)	4 pos.	12	3200 m/min	3	6
P2	POY 250D-500D (DTY150D-300D)	4 pos.	12	3200 m/min	6	12
TOTAL:		8 pos.			9	18

## 1.3 Main specifications of equipment

Table 1-3

Line	P1	P2
Positions* Lines	4 pos	4 pos.
Extruder	Φ120	Φ160
CPF	2 stage CPF-9.5/5.5 m <sup>2</sup>	2 stage CPF-15/9.5 m <sup>2</sup>
Spin beam	2 pos./spin beam	2 pos./spin beam
Gauge (mm)	1500	1600
Spin pack	Cylinder, Bottom-mounted	Cylinder, Bottom-mounted
Dia. of spinneret (mm)	Φ90	Φ95
Quenching area	1400×1400mm	1500×1400mm
Metering pump (cc/rev)	12*3.0	12*6.0
Spin finish pump (cc/rev)	12*0.08	12*0.16
Dowtherm boiler	450L /55KW	450L /55KW
Take-up (moveable type)	GR1: Φ120*120mm	GR1: Φ120*120mm
	GR2: Φ120*120mm	GR2: Φ120*120mm
Winder	ZCHTC1800/4000-12	ZCHTC1800/4000-12

## 1.4 Requirements for utilities:

- Power

	Rated voltage:	V	380/220±10%		
	No. of phases:		3 phrase, 4 wire	Rated	
frequency:	Hz	50±1.5%	2.	Cooling water	
	Pressure:	MPa	≥0.2MPa		
	Temp. of inlet:	°C	≤34°C		
	PH value:		6.5-7		
	Hardness	DH	≤12		
	Total salt content:	ppm	≤400		
	3. Chilling water ( from chiller)				
	Pressure:	MPa	≥0.2MPa		
	Temp. of inlet:	°C	≤ 8.0°C		
	PH value:		6.5-7		
	Total hardness:	DH	≤12		
	4. Water for oil (Pure water or desalted water)				
	Pressure:	MPa	≥0.1MPa		
	PH Value:		6.5-7		
	Total hardness:	DH	≤1		
	SiO2 content:	ppm	≤0.2	Fungus	
None					
	5. General compressed air:				
	Pressure:	MPa	≥0.5MPa		
	Temp.:	°C	Room temp.	Condition:	Oil&
	water-free				
	6. Compressed air for instruments:				
	Pressure:	MPa	0.5-0.6MPa		
	Temp.:	°C	Room temp.		
	Dew point:	°C	-20°C		
	Conditions:	Oil, dust and solid particles free			
	7. Compressed air for suction gun:				
	Pressure:	MPa	≥0.8MPa	Temp.:	°C Room
				temp.	
	8. Quenching chamber:				
	Wind pressure:	600Pa			
	Humidity:	75%±3			
	Temp.:	22°C±1			



## **Appendix 2: Scope of Work and Responsibilities**

### **2.1 Seller's engineering and technical service range:**

1. engineering design
  - 1) Design scope: from chip conveyor to winder. including: spin pack cleaning, pre-assembling, pre-heating , spin finish preparations and lab room.
  - 2) Plant design: including spin process, equipment, electrical, related machine and laboratory according to the buyer's requirements. At request of the buyer, the seller agrees to supervise to the contractual machine's installation.
  - 3) Design for the nonstandard equipment and platform.
  - 4) Utility pipelines and process design within the buyer's business scope.
  - 5) Preparation for the list of machine and material.
2. Technical service
  - 1) Assistance to the buyer to purchase and install all other machine, auxiliary equipment and utilities which are not supplied by the seller.
  - 2) Technical advice on other machine.
  - 3) Training program to the buyer's employee (if any).
  - 4) Trial run, commissioning of contractual machine to meet the quality standard of tested product under the normal working condition.
3. Organization of the project construction
  - 1) preparation for engineering plan and construction scheme.
  - 2) from the start date of the machine installation, seller's representatives will be dispatched to introduce and supervise the installation of auxiliary machine&utilities and explain the related drawing and trouble-shoot in the construction.
  - 3) The contractual equipment shall be installed, commissioning, started under supervision of seller's mechanical and electrical & process engineers.

### **2.2 Buyer's engineering and responsibilities**

- 1) Purchase and fast availability of the equipment and related materials as per the seller list, the supply of the power&raw material.
- 2) Heavy duty lifter, and assistance to seller's coordination&communication. 3) Management of the building projects and the quality control.
- 4) Safety education & organization of buyer's personnel and installation site security.
- 5) Human resource and organization of the buyer's personnel during the trial run. 6) Infrastructure design & construction of the building as per seller's requirement. 7) Design, installation and test of the power distribution.
- 8) Round-trip air ticket, boarding and lodging of the seller's engineer team, also salary them

### Appendix 3: Scope of delivery

Note: (S) ---supplied by seller

(B) ---supplied by buyer, which should following drawings and specifications from seller.

No.	Equipment	Specification	Qty	Note
<b>1000</b>	<b>Extrusion part</b>			
1001	Extruder-A (P1,)	a. Type: Horizontal b. Screw: $\Phi 120\text{mm}$ L/D=28 c. Drive Power: 75KW/380V d. Heating power: 42KW e. Temp. sensor: Pt100 f. Inverter:Yaskawa, Japan	1 set	S
	Extruder-B (P2)	a. Type: Horizontal b. Screw: $\Phi 160\text{mm}$ L/D=28 c. Drive Power: 132KW/380V d. Heating power: 81 KW e. Temp. sensor: Pt100 f. Inverter:Yaskawa, Japan	1 set	S
1002	Measuring head	a. Heating: dowtherm vapor from boiler b. Design Temp: 310°C c. Design Temp.: jacket:0.2MPa melt pipe:25MPa	2 set	S
1003	CPF-A (P1)	a. Type: 2 stage CPF-9.5/5.5 b. Filtration mode: candle c. Filtration area: 9.5/5.5m <sup>2</sup> d. No. of cores: 15 pcs×2+15 pcs×2 e. Precision: 25μm	1 set	S
	CPF-B (P2)	a. Type: 2 stage CPF-15/9.5 b. Filtration mode: candle c. Filtration area: 15/9.5m <sup>2</sup> d. No. of cores: 19 pcs×2+15 pcs×2	1 set	S

		e. Precision: 25 $\mu$ m		
1004	Melt pipe	a. Heating: dowtherm vapor from boiler b. Design temp.: 310°C c. Design pressure: jacket: 0.2MPa melt pipe: 25MPa d. Including static mixer	2 set	S
<b>2000</b>	<b>Spinning part</b>			
2001	Spin beam	a. Type: Single side operation, b. No. of Pos.: 2 pos./beam c. No. of ends: 12 ends d. Heating: dowtherm vapor from boiler e. Design temp.: 310°C f. Tempe. rise of tank surface $\leq 60^\circ\text{C}$ g. Design pressure of tank: 0.2MPa h. Design pressure of melt pipe: Before pump: 25MPa After pump: 35MPa melt valve: Freezing i. valve with air connector	4 set	S
2002	Frame for spin beam	a. Material: carbon steel	2 set	B
2003	Metering pump	a. Type: planetary type b. Spec.: 12 $\times$ 3.0 cc/rev---4 set 12 $\times$ 6.0 cc/rev---4 set c. No. of inlet/No. of outlet: 1/12	8 set	S
2004	Driving motor of metering pump	a. Driving mode: individual b. Type: Vertical synchronous motor and reducer c. Motor power: 1.5KW d. Reduction ratio: 1: 59	8 set	S

2005	Metering motor support	a. Material: carbon steel	2 set	B
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2006	Spin pack	<ul style="list-style-type: none"> <li>a. Type: Cylinder, bottom mounted</li> <li>b. No. of pack: 12 pack/pos.</li> <li>c. Dia. of pack: <math>\Phi</math>90mm 48 sets <math>\Phi</math>95mm 48 sets</li> <li>d. Spinneret: 1/pack</li> <li>e. Filtration mode: filter screen &amp; metal mesh</li> <li>f. Design pressure: 35MPa</li> <li>g. With position pin</li> </ul>	96 set	S
2007	Spinneret	<ul style="list-style-type: none"> <li>a. Type: Round</li> <li>b. Size: <math>\Phi</math>90mm &amp; <math>\Phi</math>95mm</li> <li>c. No. of filament: pending</li> <li>d. Hole cross section: round</li> </ul>	96 pc	S
<b>3000</b>	<b>Quenching part</b>			
3001	Quenching chamber	<ul style="list-style-type: none"> <li>a. Type: cross quenching</li> <li>b. Blowing area: 1400*1400mm &amp; 1500*1400mm</li> <li>c. insulating plate with lock air regulator</li> <li>d. removable vertical screen</li> <li>e.</li> </ul>	8 set	S
3002	Quenching chamber base	<ul style="list-style-type: none"> <li>a. Material: shaped steel</li> </ul>	8 set	S
3003	Yarn duct	<ul style="list-style-type: none"> <li>a. Material: high quality aluminum</li> </ul>	8 set	S
<b>4000</b>	<b>Dowtherm heating system</b>			
4001	Dowtherm Boiler	<ul style="list-style-type: none"> <li>a. Type: Electrical heating,</li> <li>b. Design temp.: 310°C</li> <li>c. Design pressure: 0.2MPa</li> <li>d. Heating power: 55kW</li> <li>e. Volume: 450L</li> <li>f. Safety device: blowing disc and safety valve, electrical contact pressure gauge and over-voltage breaking</li> <li>g. Alarm for overheating</li> </ul>	2 set	S

4002	Pipes for dowtherm boiler	a. Seamless pipe for dowtherm circulation, elbow	2 set	B
		b. Heating insulation material and job		
4003	Special parts for dowtherm system	a. Stop valves b. graphite washer, etc.	2 set	S
4004	Condensation tank	a. Size: Ø200×500mm b. Design temp: 310°C c. Design pressure: 0.2MPa	2 set	S
<b>5000</b>	<b>Oiling system</b>			
5001	Oil spray device	a. oil spray device, pipes and plugs b. oil recycling pipe c. oil jet, yarn guide, Maruu, Japan	8 set	S
5002	Spin finish pump	a. Spec.: 12×0.08cc/rev. ---4 sets 12×0.16cc/rev. ---4 sets b. Inlet/Outlet: 1/12	8 set	S
5003	Finish oil driving system	a. Synchronous motor, inverter control b. motor gearbox: speed ratio: 1:35 speed: 20-55 rpm	8 set	S
5004	Finish oil tank	a. pipes and valves are included b. filter precision: 10um c. floating valve, sewage, overflow d. 6 pos./unit	2 set	S
<b>6000</b>	<b>Electrical control part</b>			
6001	Extruder speed control panel	a. Type: vertical, front door b. Size: 1000×600×2000mm c. inverter: Yaskawa, Japan	2 set	S
6002	Extruder temp & dowtherm temp control panel	a. Type: vertical, front door b. Size: 600×600×2000mm c. instrument: Japan	2 set	S
6003	Metering pump inverter control panel	a. Type: vertical, front door b. Size: 800×600×2000mm c. Inverter: Yaskawa, Japan d. Control unit: 1 pos/unit	1 set	S

6004	Switching box for pumps	a. Spin pump: 1 group/pos. b. Finish pump: 1 group/pos. c. Call : 1 group/pos. d. Alarm: 6 pos/set	8 set	S
6005	Finish oil pump control panel	a. Type: vertical, front door b. Size: 600×600×2000mm	1 set	S

		c. Inverter: Yaskawa,Japan d. Control unit: 1 pos/unit		
6006	Temp. sensor for extruder	(TICA)Pt100 (incl. in item 1001)	2 set	S
6007	Temp. sensor for measuring head	(TIA) Pt100 (incl. in item 1002)	2 pcs	S
6008	Melt pressure sensor (before filtration)	(PI) (Dynisc) 0-35MPa	2 pcs	S
6009	Melt pressure sensor (after filtration)	(PICA)Pt492(Dynisc) 0-35MPa	2 pcs	S
6010	Pressure sensor for spin pack	(PI)( Dynisc) 0-50MPa	2 pcs	S
6011	Temp. sensor for spin beam	(TIA)Pt100 double	2 pcs	S
6012	Temp. sensor for condensation tank	(TIA) Pt100	2 pcs	S
6013	Electrical contact point gauge for dowtherm boiler	(PICA) Pt100, 0~0.25MPa	2 pcs	S
6014	Temp. sensor for boiler over heating	(TIA) Pt100	2 pcs	S
6015	Temp. sensor for boiler HTM	(TICA) Pt100	2 pcs	S
6016	cables	Signal cable and high temp. proof cable	1 set	S
		Universal cables	1 lot	B
<b>7000</b>	<b>Take-up and winding part</b>			

7001	Take-up frame	<p>a. gauge: 1500mm</p> <p>b. 4 pos./set, 12 ends/pos.</p> <p>c. yarn guide, 12 ends/set</p> <p>d. Pipe inside the machine for:</p> <p>    1) migration nozzle</p> <p>    2) yarn cutter &amp; aspirator</p> <p>e. switch box for: roller drive and call</p> <p>f. yarn cutter &amp; aspirator</p> <p>g. migration, AWA, Japan</p>	2 set	S
7002	winder	<p>a. ZCHTC1800/4000-12</p> <p>b. Mech.speed: Max.4000m/min</p> <p>c. 12 ends/winder</p> <p>d. tube: Ø125×Ø140×150mm</p> <p>e. Stroke: 120 mm</p> <p>f. package: Ø430mm</p>	8 set	S
7003	Guide roller GR1 (fixed)	<p>a. size Ø120×120mm</p> <p>b. motor: 300w</p> <p>c. surface: ceramic Ra0.8-1.2µm</p> <p>d. speed: 2000-4000m/min</p>	8 set	S
7004	Guide roller GR2 (movable)	<p>a. size Ø120×120mm</p> <p>b. motor: 300w</p> <p>c. surface: ceramic Ra0.8-1.2µm</p> <p>d. speed: 2000-4000m/min</p>	8 set	S
7005	Air stand	<p>a. filter, water separator, regulator.</p> <p>b. air pipes and fittings</p>	1 set	S
7006	Winder inverter panel	<p>a. Type: vertical, front door</p> <p>b. Size: 700×400×1700mm</p> <p>c. Inverter: Meidensha, Japan</p> <p>d. Control unit: 1 pos/unit</p>	8 set	S
7007	Guide roller inverter panel	<p>a. control unit: 1 position</p> <p>b. include in 7006</p>	8 set	S
7008	Switching box for guide roller	<p>a. call ana alarm</p> <p>b. lift cylinder control button</p>	8 set	S

7009	Suction gun	a. Tank for waste yarn prepared by buyer b. With high-pressure pipe and waste tube	2 set	S
7010	Base plate	4 pos./set	2 set	S
7011	Cables and wires	Shield cables	1 lot	S
		Cable and wires for winders	1 lot	S
		Cables and wires for connecting control cabinet with machines	1 lot	B
7012	Wires bridge		1 lot	B
7013	take-up monitor	a. Used for all lines	1 set	S
7014	Pipes outside the machine	Such as compressed air pipes and accessories Such as finish oil transferring pipe and accessories. Such as cooling water pipes, etc	1 lot	B

**Appendix 4: Tools List**

No.	Type and spec.	Qty	Note
01	extruder dismount tool	2 set	S
02	filter tool	2 set	S
03	spin pump wrench	1 set	S
04	pump plate wrench	1 set	S
05	pump spacer lifter	1 pcs	S
06	spin pack tool	1 set	S
07	Pack hydraulic press	1 set	S
08	flushing plate( mm)	8 pos.	S
09	blind pump plate	8 pos.	S
10	spin beam aligner	1 pcs	S
11	pump drive locationer	1 pcs	S
12	sensor box spanner	1 pcs	S
13	winder special tool	1 set	S
14	winder trolley	1 set	S
15	Manual operation board	1 set	S

**Appendix 5: Spare Parts**

No.	Type and spec.	Qty	Note
01	spin pack & spinneret	96 set	S
02	winder	1 set	S
03	GR1 (with motor)	1 set	S
04	GR2 (with motor)	1 set	S
05	2% of total final contract value for spinning machine		S

## Appendix 6                      Quality Guarantee

### 6.1 Pre-condition

1. Requirements of polymer chips

Viscosity (IV)	0.65dL/g
Viscosity deviation	±0.01
Melting point	≥260°C
Carboxyl	≤35mmol/kg DEG
≤1.0% moisture	≤0.4%

2. Spin finish oil

DAKO or Takemoto spin finish oil.

3. The installation materials are supplied by the buyer according to the seller's advice.

The installation and the start-up are carried out under the guidance and supervision of the seller.

4. Moisture of the polyester chip ≤25ppm, viscosity decrease <0.02

### 6.2 Seller's guarantee

1. Melt transfer system (including extruder ,filter, spin beam and spin pack) can withstand pressure of 25MPa before spin pump and 35MPa after spin pump. And shall be good airtight, no leakage.
2. The precision of the temperature at each heating zone ≤±1.5°C.
3. The dowtherm system shall be airtight, heating uniformity and precision of temperature control is±1°C.
4. Quenching system has uniform air blowing, air speed range≤ 10%. Air blowing range=(max. Air speed-min. Air speed)/max. Air speed\*100 %
5. The melt pressure feedback system of the extruder is high sensitive. The melt pressure changes≤ ±0.5MPa.
6. Gear boxes for extruder and spin pump run smoothly, Lubricated well, no vibration, no abnormal sound, and no oil leakage.
7. Under normal condition, surface temp. rise for the extruder gear box≤ 30°C. And surface temp. rise for spin pump gear box≤ 20°C.
8. when the ambient temp≤ 30°C.the average surface temp. of the insulation jacket of the spin beam is≤ 60°C.
9. precision of the inverter <0.05 %
10. In the electric control system, insulation resistance between the main circuit and the ground is not less than 1MΩ.
11. Electric device has good appearance and the component arrangement is reasonable.

### 6.3 The test

#### 1. Quality Index

No.	Quality Item	Unit	Quality Index
1	Line NO.		P1-P2
2	product	D/F	S.D.150/48
3	Spin speed	m/min	3200
4	Denier Deviation	%	±1.2
5	Denier CV	CV%	≤1.2
6	Tenacity	cN/dtex	≥2.2
7	Tenacity CV	CV%	≤3.0
8	Elongation	%	M1±4.0
9	Elongation CV	CV%	≤3.0
10	Oil Content	%	M2±0.30
11	Unevenness(normal)	%	≤1.5
12	Tail-end	turn/bobbin	≥1.5
13	Oil Stain	cm 2	None
14	Shaping		Good
15	Shade		Normal
16	Accepted Product (=First Class)	%	≥98
17	Full Package	%	≥98
18	chip consumption	ton/ton product	1.025

**Note:**

- 1) M1 range=POY120-145, and if M1 is fixed, it should be kept unchanged.
- 2) M2 range= POY0.3-0.6, and if M2 is fixed, it should be kept unchanged.

#### 2. Acceptance test

The acceptance test shall be continuously for 72 hours as trial run, and this acceptance test must start within 30 days in any cases after the erection, based on above quality index.

Upon meeting quality index, the buyer shall consider it unconditionally as successful commissioning and issue a acceptance certificate within 3days after this test.



In case this acceptance test fails to start within 30 days after the erection due to the buyer's responsibility, this acceptance test shall be regarded as successfully conducted and thus the acceptance test certificate shall be issued by the buyer within 35 days after the erection.

In case the test can not pass within the trial run (72 hours), a new trial run may be tested again, and total times should not be more than 3 times.

### **3. Sampling method**

Each shift take one yarn package from each position to test and take average value as the result.

### **6.4 mechanical guarantee**

Supplier shall repair and replace any part at supplier's own expenses, if, within 12 months from the date of mechanical commissioning or 18 months from the shipment date, whichever is earlier.

This mechanical guarantee does not apply to any parts, which fail as a result of fair wear and tear or improper handling or improper maintenance of the plant.

## **Appendix 7 Agreement on Erection Supervision**

1. On request of the Buyer, the Seller agrees to provide supervision of the contractual equipment.
2. Supervision Scope:
  - 2.1 Vertically from extruder to winder, horizontally to inlet of finish oil tank, quenching chamber.
  - 2.2 Wiring, cable duct of the work site shall be done by the Buyer.
  - 2.3 Sufficient buyer personnel shall be available to install contractual machine.
  - 2.4 The Buyer shall provide heat insulation material for the pipeline of the contractual equipment, take the insulation wrap and painting.
3. The tools and material preparation by the buyer
  - 3.1 A.C and D. C and gas welding machine, cutter, lifter and commonly used tools, etc.
  - 3.2 before seller supervisor's arrival, necessary material as per schedule should be available

## Appendix 8 Utilities & Auxiliary equipment

Note: (S) ---supplied by seller

(B) ---supplied by buyer, which should following drawings and specifications from seller.

No.	Name	Quantity	Specification	Note
<b>Utilities</b>				
01	Air compressor	1 set	a. 23Nm <sup>3</sup> /min,8Kgf/cm <sup>3</sup>	B
02	Crystallizer & dryer	1 set	a. chip conveyor:3000kg/h crystallizer & b. dryer: 800kg/h 1 set	S
03	AHU	1 set	a. 40,000+10,000Nm <sup>3</sup> /H for 8 pos.	S
04	Chiller	1 set	b. 230000 Kcal/h	S
05	Master batch dosing system	2 sets	a. gravimetric type single b. station	S
<b>Auxiliary equipment</b>				
01	Vacuum cleaning oven	1 set	φ800×1000 (trolley type)	S
02	Alkali-water-washing tank	1 set	420×420×900-2 pos.	S
03	Ultrasonic cleaner	1 set		S
04	Spin pack pre-heating oven	1 set	1700×600×300	S
05	Finish oil preparation tank	1 set		S
06	Finish oil storage tank	1 set		S
07	Finish oil mixing tank	1 set		S
08	Distilled water generator	1 set		S
09	Distilled water storage tank	1 set		B
10	Cables and wires	1 lot		B
11	Pipeline	1 lot		B
<b>Lab tester</b>				
01	Measuring reel	1 set		S
02	Single yarn strength tester	1 set		S
03	Mono-trey electrical balance	1 set		S

04	Electric balance	1 set		S
05	Spinneret microscope	1 set		S
06	Digital yarn tension meter	1 set		S
07	Air speed meter	1 set		S
08	Stroboscope	1 set		S
09	Thermometer	1 set		S
10	Cables and wires	1 lot		B
11	Pipeline	1 lot		B

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