



Miza company for Import and Export.

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مخبرية خريطة مبرة ليبيا - طرابلس - رقم الهاتف: 01_091733319 - رقم الهاتف: 02_0913103162 - رقم الهاتف: 03_0923103162

Address: Al-Masira Al-Kubra Street / Opposite Al-Jumhouria Bank - Tripoli (Libya)

العنوان: شارع المسيرة الثوري / مقابل مصرف الجمهورية - طرابلس (ليبيا)

Quotation

Breakdown Price of the Quotation

Item	Description	Specification	Price US\$
1	Machinery equipments		
(1)	Limestone crushing & conveying	Heavy apron feeder Model: WB1600×10000mm Capacity: 60~180t/h Motor power: 22kW One-step hammer-type Crusher Model: PCF1616 Production capacity: 180t/h Feeding granularit: ≤600×600×900mm Discharging granularity: ≤25 mm Motor power: 315kW	540,000
(2)	Auxiliary Material Crushing & Transportation	Jaw crusher Specification: PEX-250×1000 Production capacity: 20t/h Feeding granularity: ≤210mm D Discharging granularity: 25mm Motor power: 37kW	280,000
(3)	Raw material proportioning silo & transportation	NPG impact clay crusherNPG: Φ1000×1000 Production capacity: 60~90t/h Feeding granularity: 400mm Discharging granularity: ≤30mm Material moisture: ≤20% Motor power: 45kW×2	170,000
(4)	Raw meal grinding & Waste gas treatment	Jaw crusher Specification: PEX-250×1000 Production capacity: 30t/h Feeding granularity: ≤210mm Discharging granularity: 25mm Motor power: 37kW	2,700,000
(5)	Raw Meal Homogenizing Silo& Kiln Feeding	Air swept drying mill: Φ3.8×8.6m Size input: ≤25mm Size output: ≤8~10% (remainder above 4900 hole screen4900) Production capacity: 90t/h Motor power: 1680kW	680,000
(6)	Kiln inlet pre-heater system	Grate cooler Model: LBTF1000 Capacity: 1000t/d Inlet temp.: 1400℃ Discharging temp.:Ambient temp.+65℃	1,310,000



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(7)	Rotary kiln & triple air duct	BS930 electrical precipitator Model: 18/7.5/3×9/0.4 Volume: 180000 m ³ /h Electric field area: 51m ² Designed pressure: -2000Pa Dust collection efficiency: 99.875%	840,000
(8)	Kiln outlet, clinker cooling & transport	Rotary kiln Specification:Φ3.2×50m Output: 1000 t/d Slope: 3.5 % Weight: 286 t Master motor power: 160kW	1,680,000
(9)	Coal storage	Air swept coal mill Specification: Φ2.4×4.75m Feeding granularity:≤25mm Output: 9t/h Fineness: 0.08mm Tail over: 8%	450,215
(10)	Coal powder preparation & conveying	Out moisture: <1% Master motor power: 315kW	853,177
(11)	Gypsum and mixture yard Crushing and Conveying	1-Φ6×16m cement proportioning silo	121,897
(12)	Clinker Silo, Proportioning Silo& Transportation	2-Φ12×25m clinker silo	115,950
(13)	Cement grinding & transportation	Cement mill (Closed circuit system) Specification: Φ3.5×13m Outlet specific surface diameter of cement: 340m ² /kg Production capacity: 55t/h Master motor power: 2000kW	1,955,716
(14)	Cement storage and bulk loading	O-sepa Separator Specification: N1500 Master motor power: 90kW	276,473
(15)	Cement packing and bag cement storage	8-nozzle rotary 9-packing machine 9-Model: BX-C-8WY Metering accuracy: ±240g Capacity: 80~100t/h	690,988
(16)	Compressed air station and piping net	Model: LGDF-20/8 Air capacity: 20m ³ /min Discharge pressure: 0.8 MPa	239,833
(17)	Chemical laboratory equipment	/	248,703
(18)	Truck weigh bridge	/	24,288
2	Electrical, automation, communication & motive equipment	/	3,418,242
3	Building material of stove	/	1,417,033



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العنوان: شارع المسيرة الكبرى / مقابل مصرف الجمهورية - طرابلس (ليبيا)

4	Heat preservation material	/	100,000
5	Giving and draining equipments	/	170,000
6	Non-standard materials	/	940,926
7	Project design	/	660,000
8	Technology service	/	400,000
Total costs			20,383,441

Note for the quotation

Nonstandard is the discharge pipe and gas pipe between equipments;

Civil works is not include in the price ,the civil works including workshop building, office, control room, material storage hall, concrete silo, steel structure silo. The concrete foundation (Including second grouting of equipment foundation), steel structure supporting foundation of equipment (I.e preheater tower for preheater and chimney at kiln inlet, the supporting steel frame for tertiary pipe, the supporting platform of chain conveyor for clinker, corridor \ gas and water pipe and supporting steel frame for cable tray), cable tunnel, water drainage ditch, road, boundary wall etc;

Erection cost is not included in the price

The technical service cost exclude the extension fee for working permit visa, the work permit visa extension fee of the technical service person shall be responsible by the buyer;

Various kinds of fee charged by local government for the seller's employee shall be responsible by buyer;

Various lubricants, grease and any other things which is not permitted to export shall be responsible by buyer;

Plant supply power voltage is 10kV.



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العنوان: شارع المصيرة الشري / مقابل مصرفه الجمهورية - طرابلس (ليبيا)

Technical Specification of 1,000t/d clinker line

Cement Production Line 1,000t/d





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Part 1 Technical Specifications

1. Forward

Construction scale: To build a production line of 1000t/d clinker cement, that is, to produce 1000 tons of cement clinker each day, 300,000 tons per year, to produce portland cement more than 347,100 tons. The output will vary according to product variety and class.

Model selection of process: To adopt the advanced technology in dry 5-stage cyclone preheater, calciner and rotary kiln, which is developed and manufactured by China.

2. Design Plan

Conditions for the plan to be built

Conditions for construction site

Suppose the construction site has good conditions, simple terrain and land features, smaller super-elevation and gentler slope, level site with less amount of works, good geological conditions without pile foundation construction.

Raw materials and fuels

Raw materials and fuels diversify in different regions, therefore, temporarily according to the cement plant construction, requirements for raw materials and fuels are as follows:

Limestone: CaO:

>48%

MgO: <3.0%

R₂O (K₂O+Na₂O) : <0.6%

SO₃: <1.0%

Cl-: ≤0.015%

Free silicon f-SiO₂

Flinty: <4.0%

Quartzose: <6.0%

Clay materials: R₂O (K₂O+

Na₂O) : ≤4.0% SO₃: ≤2.0%

MgO: ≤3.0%

Cl-: ≤0.015%

Silica modulus (SM) : 3.0~4.0

Alumina iron modulus (AM) : 1.0~3.0

Siliceous materials:

SiO₂: ≥80%

MgO: ≤3.0%

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$K_2O + Na_2O$: $\leq 2.0\%$

SO_3 : $\leq 2.0\%$

In-plant particle size: $< 350\text{mm}$

Ferruginous materials:

Fe_2O_3 : $> 40\%$

Gypsum:

$CaSO_4 \cdot 2H_2O$: $> 60\%$

In-plant particle size: $< 350\text{mm}$

Using bituminite in burning, and satisfying the following conditions:

Table 2.1-1

Item	Coal for fuel (bituminite)
Volatile (Vad)	18%~35%
Ash (Aad)	$< 20\%$
Persulphur (St,ad)	$< 1.5\%$
Caloricity (Qnet,ad)	$> 21730 \text{ kJ/kg}$
Moisture (Mt)	$< 15\%$

Water qualities:

Cloudiness: $< 5\text{mg/l}$

PH value: 6.5~8.5

Hardness(Germany): < 15

Fuels

Coal grain: $< 200\text{mm}$

Material balance list

Table 2.1-2

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No.	Name of material	Natural moisture (%)	Consumption (t/t-cl)		Balanced material (t)					
					Dry			Wet		
			Dry	Wet	Per hour	Per day	Per year	Per hour	Per day	Per year
1	Lime stone	1	1.196	1.208	49.83	1196	358800	50.33	1208	362400
2	Clay I	15	0.096	0.113	4	96	28800	4.71	113	33900
3	Clay III	15	0.188	0.221	7.83	188	56400	9.21	221	66300
4	Iron powder	10	0.01	0.011	0.42	10	3000	0.46	11	3300
5	Raw mea		1.514		63.1	1514	454200			
6	Clinker				41.67	1000	300000			
7	Cement				47.8	1157	347100			
8	Admixture	1	0.10	0.11	4.38	105	31500	4.82	115.6	34650
19	Gypsum	3	0.04	0.041	1.75	42	12600	1.79	43.1	12915

Remarks: 1. Annual utilization percentage of kiln is 82.2%.

2. Admixture rate in cement is 10%.

3. Heat consumption of clinker: 850kcal/kg.cl

Electric Power

Power will be supplied by the owner. Voltage should be 10.5kV and frequency 50HZ.

Source of water

Water for production and domestic use will be provided by the private well.

General transportation plan

Overall layout

According to the conditions of the construction site, and as required by the production line process and arrangement, and requirements for corresponding auxiliary workshops, the production line shall be installed within the site of length × width =300m×400m .

Vertical arrangement and drain

The indoor elevation design for workshops is 0.30m (The relative road elevation is ±0.000). The site uses gentle slope with 1.5% of slope to one side, which is conducive to draining rain water. Surface water will collect into plant gutters according to the physical features. Gutters are places on one side of the roads, taking the form of open drainage and covered gutters. Open drainages shall be covered when crossing the roads.

Main technical and economic indicators for the general plan



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Main technical and economic indicators for the general plan are as follows

- (1) Plant occupying area: 120000m²
- (2) Building occupying area: 11000m²
- (3) Road and square occupying area: 23000m²
- (4) Area for storage yard and operating site: 4400m²
- (5) Afforestation area: 16000m²

(The indicators for this part are subject to modification after general plan is determined)

Production process

Process design scale and product varieties

Design scale: Use a $\Phi 3.2 \times 50$ m rotary kiln, the kiln inlet takes KSF1000 5-stage cyclone preheater and calciner system with clinker production capacity of 1000t/d and clinker heat consumption of 850kcal/kg.cl.

Storage method and period of different materials

Table 2.3-1



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No.	Material	Type of storage	Capacity	Period
1	Limestone	2-Φ12×24m proportioning silo	6000	4.2d
2	Clay	24×45m pile	3300	13.71d
		1-Φ6×12m proportioning silo	260	1.08d
3	Iron ore	1-Φ6×12m proportioning silo	260	14.4d
4	Sandstone	1-Φ6×12m proportioning silo	260	15 d
5	Raw meal	1-Φ12×30m homogenization silo	2262	1.45d
6	Clinker	2-Φ12×25m clinker silo	6700	6.7d
7	Additives	1-Φ6×16m cement proportioning silo (reject and additives silo)	188	1.32d
8	Additives	1-Φ6×16m cement proportioning silo	188	1.32d
9	Gypsum	1-Φ6×16m cement proportioning silo	290	4.41d
10	Cement silo	2-Φ12×33m circular silo	2×3300	2×2.14
11	Bag cement storage	24×49m bag cement storage	1700	1.5 d
12	Raw coal	27×84m raw coal Pre-homogenization	3920	25.35d

Working regulations for main workshops

Table 2.3-2

No	Department	Schedule	Shift System	Weekly Work Hour (h/d×d/w)
1	Limestone crushing & transport	Non-continuous	2	10×5
2	Clay crushing & transport	Non-continuous	1	8×7
3	Sandstone & iron ore crushing & transport	Non-continuous	1	8×5
4	Raw coal pre-blending & transport	Continuous	3	24×7
5	Raw materials proportioning station & transport	Continuous	3	24×7
6	Raw mill	Continuous	3	24×7
7	Kiln inlet & raw mill waste gas treatment	Continuous	3	24×7
8	Raw Meal Homogenizing Silo & Kiln Feeding	Continuous	3	24×7
9	Burning system	Continuous	3	24×7
10	Kiln outlet clinker cooling & transport	Continuous	3	24×7
11	Clinker storage	Continuous	3	24×7



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12	Gypsum & mixture yard crushing & transport	Non-continuous	1	8×3
13	Cement mill	Continuous	3	24×7
14	Cement silo	Continuous	3	24×7
15	Cement packing & bulking	Continuous	2	14×7
16	Coal homogenization & transport	Non-continuous	1	8×3
17	Coal Grinding	Continuous	3	24×7
18	Air compressing station	Continuous	3	24×7

List of main equipment

Table 2.3-3

No.	Name	Model and specifications	Quantity	Annual utilization ratio (%)
1	Crushing of limestone	Heavy apron feeder Model: WB1600×10000mm Capacity: 60~180t/h Motor power: 22kW	1	30.51
		One-step hammer-type crusher Model: PCF1616 Production capacity: 180t/h Feeding granularit: ≤600×600×900mm Discharging granularity: ≤25 mm Motor power: 315kW	1	30.51
2	Crushing of sandstone	Jaw crusher Specification: PEX-250×1000 Production capacity: 20t/h Feeding granularity: ≤210mm Discharging granularity: 25mm Motor power: 37kW	1	12.41
3	Crushing of clay	NPG impact clay crusherNPG: Φ1000×1000 Production capacity: 60~90t/h Feeding granularity: 400mm Discharging granularity: ≤30mm Material moisture: ≤20% Motor power: 45kW×2	1	15.93
4	Crushing of raw coal	Jaw crusher Specification: PEX-250×1000 Production capacity: 30t/h Feeding granularity: ≤210mm Discharging granularity: 25mm Motor power: 37kW	1	25.61



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5	Grinding of raw materials	Air swept drying mill: $\Phi 3.8 \times 8.6\text{m}$ Size input: $\leq 25\text{mm}$ Size output: $\leq 8 \sim 10\%$ (remainder above 4900 hole screen 4900) Production capacity: 90t/h Motor power: 1680kW	1	58.98
6	Firing kiln end	Five-stage cyclone pre-heater C1: $\Phi 3800$ C2: $\Phi 5400$ C3: $\Phi 5400$ C4: $\Phi 5800$ C5: $\Phi 5800$ KSF Decomposing furnace	1	82.2
		High-temperature fan: High-temperature fan (with governing fluid coupling) Model: W6-2 \times 39-2No21.5F Volume: 255000m ³ /h Full pressure: 7100Pa Gas temperature: 350°C (Max. 450°C)	1	82.2
8	Waste gas treatment	BS930 electric dust-collector Specification: 26/12.5/3 \times 8/0.4 Handling blast volume: 300000m ³ /h Smoke and gas temp.: 120°C (Max. 300°C) Inlet dust density: 80g/Nm ³ Outlet dust density: <100mg/Nm ³ Dust collection efficiency: 99.875% Gas dew point: over 47°C	1	82.2
		Conditioning tower Specification: $\Phi 6.5 \times 26\text{m}$ Volume: 152700~223600m ³ /h Inlet air temp.: <400°C Outlet air temp.: <150°C Water-spraying volume: 2.4~13m ³ /h	1	82.2
		Waste gas fan Model: Y4-73No25D Volume: 280000 m ³ /h Full pressure: 1700 Pa	1	82.2
9	Kiln outlet	Grate cooler Model: LBTF1000 Capacity: 1000t/d Inlet temp.: 1400°C Discharging temp.: Ambient temp.+65°C	1	82.2
		BS930 electrical precipitator Model: 18/7.5/3 \times 9/0.4 Volume: 180000 m ³ /h Electric field area: 51m ² Designed pressure: -2000Pa Dust collection efficiency: 99.875%	1	82.2



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10	In-kiln	Rotary kiln Specification: $\Phi 3.2 \times 50\text{m}$ Output: 1000 t/d Slope: 3.5 % Weight: 286 t Master motor power: 160kW	1	82.2
11	Preparation of pulverized coal	Air swept coal mill Specification: $\Phi 2.4 \times 4.75\text{m}$ Feeding granularity: $\leq 25\text{mm}$ Output: 9t/h Fineness: 0.08mm Tail over: 8% Out moisture: $< 1\%$ Master motor power: 315kW	1	76.17
12	Crushing of gypsum & limestone	Jaw crusher Specification: PE-250 \times 750 Production capacity: 20t/h Feeding granularity: $\leq 210\text{mm}$ Discharging granularity: 15~50mm Master motor power: 30kW	1	30.15
13	Cement grinding	Cement mill (Closed circuit system) Specification: $\Phi 3.5 \times 13\text{m}$ Outlet specific surface diameter of cement: $340\text{m}^2/\text{kg}$ Production capacity: 55t/h Master motor power: 2000kW	1	75
		O-sepa Separator Specification: N1500 Master motor power: 90kW	1	
14	Cement packing	8-nozzle rotary packing machine 9-Model: BX-C-8WY Metering accuracy: $\pm 240\text{g}$ Capacity: 80~100t/h	1	53.62
15	Compressed-air station	Model: LGDF-20/8 Air capacity: $20\text{m}^3/\text{min}$ Discharge pressure: 0.8 MPa	3	84.93

Simplified description of the process

(1) Limestone crushing and transportation

After limestone is conveyed from mine to plant, if crusher is switched on, LS will be directly unloaded to receiving pit, and then by heavy duty apron feeder sent to single hammer crusher PCF1616 to be crushed, if crusher is switched off, LS will be unloaded to open-air stockpile, and then sent to receiving bin via loader for crushing

The crushed limestone is sent to two limestone dosing silos (dia. $\Phi 12\text{m}$) by belt conveyer, elevator and tee valve.

(2) Auxiliary material crushing and conveying

When the exclusive receiving pit is free, clay is unloaded directly to the pit, and then sent to clay proportioning silo via apron feeder, tooth crusher, belt conveyer and elevator. When the receiving pit is full, clay will be firstly stacked at shed, and then conveyed by



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forklift to receiving pit when it is free, at last, it is conveyed to clay proportioning silo by apron feeder, crusher, belt conveyer and clay proportioning silo.

When the exclusive receiving pit is free, iron ore and sandstone is unloaded directly to the pit, and then sent to respective proportioning silo via raw crusher, elevator. When the receiving pit is full, they will be firstly stacked at shed, and then conveyed by forklift to receiving pit when it is free, at last, it is conveyed to respective proportioning silo by crusher and elevator.

(4) Raw material proportioning silo and conveying 原料均化库和输送

Raw material proportioning silo is composed of two concrete silos and three steel slab bins, and be measured by variable speed belt scale. Limestone silo consists of two $\Phi 12\text{m}$ concrete silos, used for storage and proportioning. The proportioning bins is $\Phi 6\text{m}$ 、 $\Phi 6\text{m}$ and $\Phi 6\text{m}$ respectively for clay, sandstone and iron ore.

(5) Raw mill & waste gas treatment at kiln inlet

Proportioned raw material will be fed onto the air swept drying mill with size of $\Phi 3.8 \times 8.6\text{m}$. In the process of rotating, raw meal will be raised by material raising device in the raw mill and sufficiently contact with hot gas from high-temperature fan at kiln inlet. By this means, raw meal will be dried. Dry raw meal is ground in the mill. Then the raw meal will fed onto high efficiency separator. Fine powder will be fed onto the raw meal-homogenizing silo via electric flap valve and air slide while coarse powder returned to the mill via electric flap valve and air slide. Hot gas from preheater goes through humidification tower and high-temperature fan and then divides into two parts, one part goes directly to electric dust collector, and the other part goes to raw mill head, and then 1/8 of this part goes to mill end. Waste gas out of mill firstly goes through high efficiency separator and raw mill fan (with inlet regulation valve), and joins the waste gas to the electric dust collector. After that, the waste gas will be purified by the electric dust collector and drained to the air.

When raw mill is working: after conditioning tower treatment, waste gas come from pre-heater shall be blown to raw mill by high temperature fan and discharged by the system fan, then dedusted and cleaned by the bag filter at kiln inlet, finally released via chimney into the atmosphere by kiln exhaust fan.

When raw mill is off: after conditioning tower treatment, waste gas come from pre-heater shall be blown to kiln inlet bag filter, finally released via chimney into the atmosphere by kiln exhaust fan.

(6) Raw meal blending silo & kiln inlet feeding



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A seat of $\Phi 12\text{m}$ MF homogenization silo combining raw meal storage and homogenization is employed in this project, presenting good blending performance, low power consumption, simple system, convenient management etc features.

(7) Kiln inlet preheating system

Kiln inlet will use a system of precalcining outside kiln, which is composed of single 5-cyclone preheater and KSF calciner, with throughput 1000t/d.

(8) Kiln middle and kiln outlet

After precalcining, raw meal enters $\Phi 3.2 \times 50\text{m}$ rotary kiln to be burnt, with heat consumption 800kCal/kg-cl. High temperature clinker from rotary kiln, coming into grate cooler, is cooled down sharply by cold air blown below grate plates. The temperature of discharged clinker is $+65^\circ\text{C}$ at ambient temperature. The cooled and crushed clinker is conveyed to clinker silo by bucket chain conveyor.

Partial high temperature exhaust gas from grate cooler becomes secondary air; the other part becomes combustion air for calciner via tertiary air duct; and the other part is released to atmosphere after the treatment of kiln outlet electric dust collector. The collected dust then is carried into clinker silo via chain conveyor and clinker bucket conveyor.

(9) Clinker storage & transportation

Clinker storage will use two $\Phi 12\text{m}$ silo with high cylinder wall, with total capacity 6700t, storage period 6.7d. At the side of clinker silo, two bulk system are equipped.

Clinker is discharged through bottom belt conveyor as per the proportion set by weigh feeder.

(10) Cement proportioning silo and conveying

Cement proportioning will use three steel slab bins for storage, and be weighed by frequency speed regulation belt scale. The spec of gypsum silo and other two additives silos are respectively $\Phi 6\text{m}$.

(11) Cement grinding and conveying

Mixtures from cement dosing station will be fed into $\Phi 3.5 \times 13\text{m}$ cement mill for grinding by belt conveyor; and then conveyed into N1500 O-Sepa separator through bucket elevator. Air volume of O-Sepa separator is 90000~110000 m^3/h . Qualified cement out of O-Sepa separator will be collected by PPCS96-2 \times 8 pulse bag filter and conveyed into bucket elevator for cement storage by air slide and then fed into cement silo; Unqualified material will be returned into cement mill by air slide to continuously be ground. Adjustable speed Converter is adopted for O-Sepa separator motor; fineness can be flexibly and reliably adjusted to completely meet with surface requirements on producing cement. Waste gas out



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from of mill will enter the separator for treatment together. Waste gas out from of grinding system will be purified by bag filter and then exhausted at the atmosphere ; outlet density of exhausted waste gas shall be less than 50mg/Nm³.

(12) Cement storage and bulk loading

The finished product is conveyed by wire belt elevator and air slide to 2-Φ12m cement silo for storage. Two silos are equipped with bulk at side.

(13) Cement packing and bag cement storage

Cement packing system adopts an eight-spout rotary packer, the cement from silo is packed here, and the packed will be unloaded to bag cement storage.

(14) Gypsum and additive crushing conveying

When the exclusive receiving pit is free, gypsum is unloaded directly to the pit, and then sent to cement proportioning silo via apron feeder, tooth crusher, belt conveyer. When the exclusive receiving pit is full, gypsum will be firstly stacked at shed, and then conveyed by forklift to receiving pit when it is free, at last, it is conveyed to cement proportioning silo by apron feeder, crusher and belt conveyer.

When the exclusive receiving pit is free, additives are unloaded directly to the pit, and then sent to cement proportioning silo via belt conveyer. When the exclusive receiving pit is full, additives will be firstly stacked at shed, and then conveyed by forklift to receiving pit when it is free, at last, they are sent to cement proportioning silo via belt conveyer.

(15) Pulverized coal preparation

The raw coal from preblending stockpile is conveyed to raw coal bin by belt conveyer, and a weighing scale is placed at the bottom of this bin. The weighed raw coal comes to vertical mill to be ground. When the moisture of feed raw coal is less than 10%, the moisture of ground coal will be less than 1%, the output for each set will be 15t/h. After grinding, pulverized coal will firstly be collected by pulse bag filter of explosion proof type and then conveyed by screw conveyor to coal bin for storage. The exhaust gas will be emitted to the atmosphere after purge. A weighing system is equipped at the bottom of pulverized coal bin. After weighing, pulverized coal will be sent respectively to kiln outlet and kiln inlet burner.

Auto CO₂ extinguishing system is used for fire protection. Temperature measuring points respectively locate at pulverized coal bin, bag filter and coal mill. Once there is fire, the point rises to set temperature, CO₂ extinguishing system will be automatically started up.

(16) Air Compressor Station

There are two air compressor stations on site that is 3 sets with air capacity 20m³/min and discharge pressure 0.8Mpa. It can totally meet the demand of all gas control valves,



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preheater blowing, measuring device and pulse bag filter for compressed air.

(17) Central laboratory

A central laboratory (located in central control building) takes charge of the normal chemical analysis and physical tests of raw materials, fuels, semi-finished or finished products, guarantees the product quality at each stage, and is a headquarter for regulating, managing and supervising over cement quality.

Electrical and automation plan

Electrical

1) Design scope

Power supply for and control of the workshops and auxiliary production workshops during the whole line from the raw material's into-factory and cement products-out-factory.

2) Power supply

The owner of the present project provides one 10.5kV power as primary supply for main substation with trolley wire. The voltage level of the primary supply is 10.5kV. The distance from the plant to the power grid is 1 km. In addition, the owner provides one standby power for the guard's system, the production line's first level load (rotary kiln, slotted one-room of blast fan, fire pumps and computer system). If they fail to provide, establish one 300kW diesel generator system.

10.53) Voltage levels

Power supply voltage: 10.5kV

Mid-voltage distribution voltage: 10.5kV

Mid -voltage motor voltage: 10kV

Low-voltage distribution voltage: 0.4 kV

Low-voltage motor voltage: 380V

Substation DC operating voltage: DC 220V

Lighting voltage: AC 220V

Checking and repair lighting voltage: AC 36V

4) Main technical and economic indications

Installed capacity: 10070kW

Calculated load: 7049kW

Required factor: 0.70

Natural power factor: 0.75

Made-up power factor: 0.92

Total annual power utilization: 4.62×10^7 kWh

Cement comprehensive current drain: 110kWh/ton cement



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5) Plant transformation station and electricity office

According to the overall layout and each workshop, there is one 10kV plant distribution station, which adopts unattended micro-computer for comprehensive protecting system operation. Within the plant, there are established mid-voltage distribution room, low-voltage distribution room transformer and computer room, etc.

6) Workshop substations are established separately and within the workshop there is transformer room and low-voltage distribution room.

Substation for Raw material with one 630kVA transformer

Substation for raw material pulverizing with one 800kVA transformer

Substation of kiln end with one 1250kVA transformer

Substation of kiln head with one 1000kVA transformer

Substation for cement pulverizing with one 1000kVA transformer

Inside the mid-voltage distribution room in the plant distribution station there are 23 mid-voltage switch cabinets, in which two are spare and 10kV mid-voltage bus single bus operation.

Inside the workshop transformer station, there is transformer room and low-voltage distribution room. Inside the low-voltage distribution room there is low-voltage distribution screen and reactive power auto make-up screen.

7) Measurement and metering of electrical

Lead-in metering return circuit: Active power meter for charging, and reactive power meter.

Transformer circuit: Active power meter, reactive power meter and ammeter.

Mid-voltage motor circuit: Active power meter, reactive power meter, ammeter and power factor meter.

Each low-voltage circuit for plant transformer station: Active power meter and ammeter.

8) Power factor

Main motor of the mill adopts static phase advancer compensation, thus increasing its power factor to over 0.98.

The low-voltage bus of the plant transformer station has reactive power automatic compensation device, thus increasing its power factor to over 0.95.

9) Grounding and lightning protection

The grounding devices for the plant transformer station and each workshop are welded one another, forming the grounding system of the entire plant. 380/220V low-voltage grounding system adopts TN-C-S system. The plant's lightning protection is designed according to China's national lightning protection standardizations.

10) Supply and distribution circuit



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All power cables and control cables use cables with copper cores. 10kV power cables use YJV-10000 XLPE insulated power cables. Low-voltage power cables use VV-1000 and VV22-1000 power cables and control cables use KVV-500 copper-core cables. Their laying method combines cable bridges, direct burial and lead-in steel pipes. When cables are in large number, use cable bridges. Otherwise, direct burial or lead-in steel pipes are preferred. The parts that go into the workshops shall be buried underground after lead-in steel pipes.

Workshop electrical

1) Power distribution for workshops

Power distribution for workshops is divided according to technical process, and power distribution for conveying facilities between workshops is done according to physical circumstances of production process.

Low-voltage power in the workshops is supplied radiately by the substation in the plant side.

All consumers in the workshops are supplied radiately by the control box.

Iron clad switches used in overhaul are equipped in the workshops.

2) Workshops control and its level

All the equipments in the main-process stream of production line are controlled by the computer control system. According to the technical process and production features, a central control room is set for the production line to carry out the computer control of the main-process line from limestone crushing to cement in bulk and packing, thus, a computer control network system of the main-process stream of production line, by which some functions for the equipments in the production line, such as supervisory control, information conversion, data processing, and report forms printing are accomplished, is developed.

Every equipment is controlled by the computers through two ways: centralized control and local control. On the side of the equipment, there are equipped with button box or control box and control option switch with unified keys, in which there are three options: centralized control, zero position and local control.

Divide all the workshops according to the control systems, each of which is set by the compulsive activating signal and fault signal.

The guyrope switches are set for the longer belt conveyers.

To ensure the safety of persons and motors, on the side of every motor, there is side button box whose control ways are local control bit, centralized control bit and zero bit. Local control bit is used for local operation and single motor test run, centralized control bit is used for centralized operation in control room, and zero bit is used for equipment overhaul.

Winding main motors of pulverizing system adopt the liquid resistor start, low-power motors of cage type do direct start, and high-power motors of cage type do soft start.



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Apply in-place centralized control or local control to other workshops in the production line which are not involved in the computer control system.

3) Electric instruments

Each of separate control points is equipped with a voltmeter.

Higher power motors are equipped with an ammeter in the control box. High voltage motors are equipped with a voltmeter, ammeter and power factor meter.

4) The distributing line for workshops

Electric wirings in workshops adopt steel pipes hidden, and the more centralized parts of electric wirings adopt the cable testing bridge frames.

5) Lighting for workshops

All production workshops are equipped with lighting distribution boxes, whose power are supplied by power distribution boxes.

6) Lightning protection for workshops

Buildings or structures higher than 15 meters in plant side are equipped with the lightning protection devices.

Automatic control system

DCS is applied to the major production workshops from crude fuel in-works to the finished cement ex-works, and have a monitoring for production process in the central control room, whose control ways are centralized control and local control. When adopting centralized control, according to technical process and equipment protection requirement, electrical equipments are divided into some groups, DCS system implements start/stop sequential control and interlock control in term of the preset program, and some state signals and alarm signals of all equipments, such as ready, operation and fault, are shown, recorded and printed in the operation station. When adopting local control, operation is carried out through the side button box, on which there are start button, stop button and changeover switch whose three ways, centralized, shut-off and local ways are used for overhaul, debugging, local startup and emergency stop for electric equipments. Generally, adopt centralized control in normal production.

Subsidiary production workshops, such as compressed-air station and circulating pump room, are controlled by the routine relay.

1) System features

Computer control system applies the DCS, consisting of process control level, control supervisor level and communication network, which has a good versatility, flexible system configuration, perfect control function, convenient data processing, centralized display operation, friendly human-machine interface, simple and standard installment, convenient



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debugging and reliable operation. Its operational aspect in Chinese cement plants has shown that applying this system can advance automation and management, improve product quality, reduce energy consumption, enhance labor productivity and ensure safety in production, thereby, create good economic and social benefit.

2) System configuration

According to technical production process, the layout of production workshops on the general drawing and the operation need, the system configuration is done as follows:

a. Process control level

- Control station for material pulverizing and waste gas handling;
- Limestone storing homogenizing and material blending station;
- Control station for burning kiln end;
- Control station for burning kiln hood;
- Control station for coal dust preparation;
- Control station for cement pulverizing;
- Control station for cement packing.

b. Control supervisor level

Central control room: Monitoring from material blending to cement pulverizing system is implemented by four operator stations.

Control room for cement packing: Monitoring from cement house roof to cement packing system is implemented by one operator station.

c. Others

Besides field control station, operating station and communication network, DCS need the following auxiliary equipments as required:

Report printer used for plant reports printing

Alarm printer used for alarm messages printing

Screen hardcopy unit used for screen hardcopy

3) System functions

As above, control system functions consist of the following three parts:

Process control level consists of all the control stations set separately their corresponding power rooms, and primarily carries out data acquisition, process control, equipment monitoring, system test and diagnosis functions.

Control supervisor level set in the middle control room carries out monitoring for production process in its control range. Have a backup between operating stations, and implement the following control functions:



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Display of data, figures and states;

Keeping historical data on file;

Fault audible alarm, record printing, state display;

Timing report forms printing

Real time and dynamic adjusting circuit parameters

Optimizing control parameters.

Because of its implementing industrial control, DCS has a rapid real time response, high reliability and good adaptation to severe industrial field environment.

Computer network-All the control stations and operating stations set in control rooms are nodes in the computer control system network.

4) Automated assembly

a. Quality control system for raw materials

In the center control room is installed a set of quality control system for raw materials, consisting of sampling equipment, small X fluorescence analyzer, a computer and its peripheral equipments and application software, which implements controlling for raw materials quality with DCS.

b. Temperature measurement equipment for kiln body of line scan

Install temperature measurement equipment for kiln body of line scan, consisting of infrared scanning equipment, a computer and its peripheral equipments and application software, which has a monitoring for surface temperature of kiln body and clearance between trochal bands and shows them in three-dimensional diagram in CRT.

c. Industrial television system

In the kiln hood and comb cooling machine, install special utiliscopes to monitor the calcination in the rotary kilns, and in the key position of material transmission, such as chamotte bucket lines, install special utiliscopes to monitor material transmission. To know more information and be convenient to centralized operating management, install monitors in the control range of all the control rooms.

d. Gas analyzer

In intakes of electric precipitation on the kiln ends and outlets of coal grind dust collection, install CO analyzers to detect CO content in waste gas and prevent from equipment breakdown.

e. Others

According to need of technical production process, in the technical line, install different detecting equipments for temperature, pressure, flow, level of material and speed to monitor



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production situations in plant complex.

Water supply and sewerage

Design scope

Water supply and drainage design involves production workshops and subsidiary ones, from crude fuels inworks to finished cements exworks, and living conditions in plant complex.

2.5.2 Water supply 1)

Water consumption

Water consumption for production: 4812.00m³/d

Included:

Cycling water consumption: 4314.00m³/d

Circulation return consumption: 4131.00m³/d

Cycling rate: 95.76%

Direct current consumption: 392.00m³/d

Water consumption in subsidiary workshops: 106.00m³/d

Domestic water consumption: 96.00m³/d

Make-up water for fire-fighting: 90.00m³/d

(according to water consumption of 180m³/d every time, finish the make-up water after 48 hours) .

Rate of draft of water source: unpredictable rate of draft in the circling system accounting for 20%, unpredictable rate of draft in the living system accounting for 30%, and designed service discharge 1248m³/d.

2) Requirement for water quality and pressure

a. Water quality

Water quality requirement of cooling water utilization for production equipments: turbidity ≤ 20.0 mg/L, hardness (CaCO₃) 80.0~250.0mg/L water temperature $< 32.0^{\circ}\text{C}$, PH = 6.5~9.0; water utilization for laboratories and meters, similar to domestic water, has a higher quality requirement.

b. Water pressure

Water pressure for production water: Water pressure for conduit entrances in workshops reach to 0.25~0.35MPa; Water pressure for domestic water supply points are not less than 0.04MPa;

Fire water pressure: Outlet pressure for outside hydrants are not less than 0.10Mpa, and water pressure for inside hydrants meet extinguishment requirement of most demanding area.

c. Water source



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According to information supplied by relevant persons in the owner's party, in construction field, there is abundant in ground water to be easy to exploit, whose water quality meets production water requirement. This project plans to drive a deep well, whose depth is dependent on hydrogeology information and water yield is not less than 1500m³/d.

d. Water catchment and supply treatment

This project plans to advise owners to purchase a submergible deep well pump of 200QJ50-100/8, through which into clear water basin is lifted the water, which is pressed and supplied to all the water utilization points by booster pump.

e. Waterworks

(1) Water supply system for production circle

To make best use of water resources and achieve water saving, cooling water for production equipments in all workshops adopts circulation and cooling system of enclosed type backflow and overbottom pressure up tower. This plan can save a group of up tower warm water pump and pool, reduce devices and structures, conserve energy, decrease land use, cut down the investment and advance circulating water availability. The water cooled through cooling tower naturally flows into circling feeding reservoir, then is pressed and supplied to cooling water points for all workshops devices and make-up water for tricking water of cement grinding body.

To maintain water quality balance, in this system, set side-filter device, through which part of circulating water is filtered into circulating water pool to reduce suspended matter content in circulating water. In this design, apply a non-cock filter as the side-filter device, and in this system, install multifunctional electronic water treatment meter to carry out water conditioning measures, such as antiscaling, descaling. Water loss and consumption in the system is made up directly by water source.

(2) Water supply system for living and fire-fighting

Living water is supplied by living water pump, water spray of conditioning tower in the kiln end, water for gas analyzer and subsidiary production water are supplied by water supply system for living and fire-fighting in the way of direct current water supply. In the kiln end, set a medium pressure pump room for water spray of conditioning tower, in which there are two multiple centrifugal pumps of D25-50x9 for pressure (one for use, and the other for standby, parameters: Q=16 m³/h, H=4.6MPa, N=55kW).

Fire-fighting adopts temporary high pressure regulation, and most demanding area hydrant hydraulic pressure is more than 10m water column. The pool of 200m³ is used for water yield regulation and water for fire-fighting indoor in 10 minutes. When having a fire,



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start two fire pumps of IS100-65-200 ($Q = 180.0\text{m}^3/\text{h}$, $H = 48.0\text{m}$, $N = 37\text{kW}$) in the circulating pump room, and increase water yield to put out it. Outdoor fire hydrants are above-ground type, which are set two sides of road near the crossroad, and whose distance is less than 120m. Diameter of trunk set hydrants is more than DN100mm, and fire-fighting water is stored in the clear water basin.

2.5.3 Water drainage

Cooling water for devices is primarily production water in the cement plant. Because this design applies recycling the enclosed circulation return collected and cooled, there is little waste water drainage of $215.0\text{m}^3/\text{d}$, in which there is none poisonous and can be drained into the near escape canal outside plant for farming irrigation.

2) Cleaning water in workshops can be drained into the rain channel nearby, and domestic sewage containing deject treated through the septic tank can be drained into the drainage pipe system for domestic sewage.

3) Sewage disposal

Discharge of living sewage in plant site is $121.00\text{m}^3/\text{d}$, mostly containing some organic substance, in which BOD5 is about 200mg/L . Advise owners to set a sewage farm near the plant side, whose equipments are installed underground, so, there is no odor, and has a greening above-ground. Sewage quantity is regulated by the regulating reservoir, in the middle of which two parts are divided through a division wall, the former is silt basin, and the latter is pump room, in which set two non-blocking sewage hidden pumps (AS10-2CB, $Q = 10.0\text{m}^3/\text{h}$, $H = 7.5\text{m}$, $N = 1.1\text{kW}$, one for use, and the other for standby). Sewage disposal uses integrated treatment equipment buried underground of WSZ-5, whose treatment capacity is $Q = 5.0\text{m}^3/\text{h}$. Sewage could drain only after its water quality reaches to the first drainage standard in Integrated Sewage Drainage Standard (GB8978-1996) ($\text{PH} = 6 \sim 9$, suspended matter $\leq 70\text{mg/L}$, $\text{COD} \leq 100\text{mg/L}$, $\text{BOD}_5 \leq 20\text{mg}$