

Technical characteristics

1. Basis Data

1.1. Geographical Data

Plant location:	Hojaib-Saveh-Iran
Altitude:	1470 m above sea level
Latitude:	35° 29' 19.13" N
Longitude:	50° 12' 18.59" E

1.2. Local Conditions

1.2.1. Ambient temperature

Annual fluctuation range:	- 10 °C min. up to + 41.5 °C max.
Extreme values for design:	- 15 °C min. up to + 45 °C max.

1.2.2. Relative humidity

Annual fluctuation range:	10% - 71%
Extreme values for design:	6% - 100%

1.2.3. Seismic & Wind

Seismic factor:	0.3 g
Design wind velocity at ground level:	80 km/h

1.3. Feed material data

Clinker

- grain size range:	0 – 30 mm
- percentage (about):	95 %
- moisture content:	1 %

Gypsum

- grain size range:	0 – 30 mm
- percentage (about):	5 %
- moisture content:	10 %

1.4. Standards

1.4.1. Applicable Standards

General and mechanical:	ISO, EN, DIN, BS, AFNOR
Electrical and control:	IEC recommendations, NF /UTE standard

1.4.2. Dominant Standards

Seismic load on structure: Iranian code of practice for seismic resistant design of buildings standard no.2800-05", 3rd Edition.

Snow & wind load on structure: Iranian standard code 519

1.5. Electrical and Control Data

Medium voltage:	6.3 kV
Low voltage:	380 V
Control voltage:	220 V AC, 48/24 V DC
Signal voltage:	4.....20 mA (analog), 24 V DC (Digital)
Frequency:	50 Hz
Required protection class for Motor:	IP 55
Required protection class for Instruments:	IP 65
Required protection class for Terminal Box:	IP 65

2. Technical Data

2.1. Ball Mill

2.1.1. Production rate - Calculation basis

Nominal material rate:	35 t/h
Working hours:	20 h/d (x 6 d/w)
Machine availability:	Min. %95 per year
Output material fineness in blaine:	3800 cm ² /g with 5% residue on the 45 µm sieve
Specific energy for ball mill (at motor shaft):	40 kWh/t (*)
Product temperature at output:	105 °C

(*) This value come from FCB-Index (N°:033/96) carried out in 1996, if required, the grindability test should be carried out by supplier

2.1.2. Technical specifications

Mill type:	two chamber mill	
Operating system:	Closed circuit	
Circulation factor:	≤ 3	
Effective grinding volume:	≥ 28.8	m ³
- first chamber volume:	~ 8.5	m ³
- second chamber volume:	≥ 18.3	m ³
Venting air:		
- required flow rate:	≥ 22,100	Nm ³ /h
- pressure drop in the mill:	≤ 200	dapa
- temperature at the mill inlet:	ambient	°C
- temperature at the mill outlet:	110	°C
- dust content at the mill outlet:	≥ 980	g/Nm ³
Rotating weight:	~ 290	ton
Critical speed ratio:	75	%
Revolving speed:	~ 17.2	rpm
Power demand at motor terminal:	≤ 1540	kW

(?) Those values should be announced by supplier

2.1.3. Constructional Features

Shell:

- first compartment length:	2.3 - 3.25	m
- diaphragm wide:	0.3 - 0.5	m
- second compartment length:	8.2 - 7	m
- discharge grate wide:	0.25	m
- total length:	≥ 11	m
- internal diameter:	≥ 3.4	m
- thickness:	≥ 40	mm
- material:	St37-3 U	

Head:

- material:	Wear resistance cast alloy	
- slant of inner web surface	23	deg

Diaphragm:

- Type:	Double layer	
- material:	Wear resistance alloy	
- Width:	250-500	mm

Mill bearings:

- type: (trunnion or shoe bearing)	shoe bearing	
- ASTM grade of mill bearing bobbitt alloy:	Grade 2	
- specific load:	?	kg/cm ²
- internal diameter	?	mm
- width	?	mm
- weight per bearing	?	Kg.
- Required cooling water:	?	m ³ /h

Internal Liners

- Mill feed conical part liners		
. Type:	?	
. material:	50CND8M (11-13% Cr.)	
. hardness:	50-60	HRC
- first compartment liners		
. Type:	lifting + classifying	

. material:	ZI50CI2M (High chromium cast alloy with ~13% Cr.)	
. hardness:	50-55	HRC
- diaphragm liners		
. Type:	?	
. material:	Wear resistance cast alloy	
. hardness:	50-55	HRC
- second compartment liners		
. Type:	classifying ZI50CI2M	
. material:	(High chromium cast alloy with ~13% Cr.)	
. hardness:	52-57	HRC
Grinding media: (supplied by customer)		
- Type:	Ball	
- required quantity:	~ 125	ton
- material	?	
- required hardness	550-600	HB
- required size range in first compartment	? to ?	mm
- required size range in second compartment	? to ?	mm
- charge average loading:	~32	%
Low pressure lubricating device for each bearing:		
- capacity:	2 x 16.5	l/min
- delivery pressure:	25	kg/cm ²
- installed motor power:	?	kW
- synchronous motor speed:	1500	rpm
- required cooling water:	?	m ³ /h
High pressure lubricating device for each bearing:		
- capacity:	2 x 5	l/min
- delivery pressure:	320	kg/cm ²
- installed motor power:	?	kW
- synchronous motor speed:	750	rpm

Electronical Ear:	Shall be included	
- brand:	?	
- type or model:	?	

Drive system for ball mill

2.2.1. Motors

Main Motor:

- brand:	Siemens or ABB-China	
- rated output:	≥ 1600	kW
- synchronous speed:	1000	rpm
- rated voltage:	6300	V
- efficiency	≥ 97	%
- starter type:	liquid starter	
- net weight:	as vendor	kg

Auxiliary motor:

- power rating:	≥ 30	kW
- synchronous speed:	1500	rpm
- rated voltage:	380	V
- efficiency	≥ 97	%
- net weight:	as vendor	kg

2.2.2. Mechanical transmission (Option 1: Side drive)

Main reducer

- brand:	Flender-China	
- model type:	H2SH	
- number of stages:	2	
- size:	≥ 19	
- gear teeth type:	Helical	
- housing material:	spherical graphite cast iron	
- nominal power rating:	≥ 4,808	kW
- output drive torque:	≥ 100,300	N.m
- thermal capacity without auxiliary cooling:	≥ 54.1	kW

- thermal capacity with auxiliary cooling:	?	kW
- theoretical life for design:	100,000	h
- input speed:	~989	rpm
- output speed:	~154.29	rpm
- ratio: (nominal / actual)	6.3 / 6.41	
- working duty:	24	h/d
- service factor at motor power:	≥ 3	
- permissible noise:	< 83	dB(A)
- temperature sensor:	yes	
- vibration sensors:	yes	
- oil level indicator:	yes	
- heating element:	yes	
- net weight:	as vendor	kg

External lubrication & water-cooling system for main reducer

- type:	Water-oil cooling	
- brand:	Flender-China	
- model:	OWGS	
- size:	≥ 06	
- oil pump:		
. type:	gear pump	
. flow rate:	75	l/min
. valve setting:	> 8	bar
. motor power:	≥ 4	kW
. synchronous motor speed:	1500	rpm
-heat exchanger:		
. heat power exchange capacity:	≥ 25	kW
. water flow rate:	≥ 2.4	l/min.
. water filter element type:	metallic 60	μ
- thermometer temperature range:	0-120	°C
- manometer pressure range:	0-10	bar
- flow controller working temperature range:	-20 to 120	°C
- net weight:	as vendor	kg

Auxiliary reducer

- brand:	Flender-China	
- model type:	KDA	
- size:	320	
- number of stages:	3	
- gear teeth type:	Helical	
- housing material:	spherical graphite cast iron	
- nominal power rating:	≥ 59	kW
- thermal capacity without auxiliary cooling:	≥ 63	kW
- thermal capacity with auxiliary cooling:	?	kW
- theoretical life for design: (min.)	100,000	h
- input speed:	~1450	rpm
- output speed:	~15	rpm
- ratio:	1:109.445	
- working duty:	24	h/d
- service factor at motor power:	≥ 2	
- permissible noise:	< 83	dB(A)
- lubrication method:	?	
- overrunning clutch type: (if any)	?	
- auxiliary cooling:	Built-in fan	
- built-in backstop:	yes	
- brake type on the 2nd high speed shaft:	Centrifugal	
- type of switch for safety:	Centrifugal	
- net weight:	as vendor	kg

External brake

- type: (shoe brake or disc brake)	shoe brake	
- brand:	Flender-China	
- model:	SB	
- size:	≥ (200/23/5)	
- thruster release type:	electrohydraulic	
- braking torque:	≥ (50-335)	N.m

- net weight: as vendor kg

High speed coupling between main motor and main reducer

- brand: Flender-China
- type: RUPEX-RWN
- size: ≥ 560
- nominal torque: $\geq 39,000$ N.m
- service factor at motor power: ?
- net weight: as vendor kg

High speed coupling between auxiliary motor and auxiliary reducer

- brand: Flender-China
- type: RUPEX-RWB
- size: ≥ 162
- nominal torque: ≥ 750 N.m
- service factor at motor power: ?
- net weight: as vendor kg

Low speed coupling between auxiliary reducer and main reducer

- brand: Flender-China
- type: RUPEX-RWN
- size: ≥ 560
- nominal torque: $\geq 39,000$ N.m
- service factor at main reducer power: ?
- net weight: as vendor kg

Low speed coupling between main reducer and pinion

- brand: Flender-China
- type: ZAPEX-ZZS
- size: ≥ 505
- nominal torque: $\geq 250,000$ N.m
- nominal power rating: 4053 kW
- service factor at main reducer power: ≥ 2.16
- net weight: as vendor kg

Girth gear:

- teeth type: (spur or helical) as vendor

- number of teeth:	186	
- module:	28	
- pressure angle:	20	°
- face width:	550	mm
- machining method:	hobbing	
- Cutting quality: (as per ISO 1336)	8	
- Roughness in the teeth area:	3.2	Ra
- Girth gear width:	730	mm
- number of sections:	2	
- external diameter:	5286.68	mm
- internal diameter:	3900	mm
- theoretical life for design:	100,000	h
- material: (as per FLS material data sheet 3410)	GS34CrNiMo6	(1.6582)
- blank construction method:	casting	
- Casting tolerance: (as per)	ISO 8062-3	DCTG14
- hardness:	250-300	HB
- Tensile strength:	800-950	Mpa.
- Heat treating: (as per FLS material data sheet 3410)	AQ+T	
- net weight: (approx.)	15,400	kg.

Girth gear oil spray device

- type:	?	
- oil flow rate:	36,000	cm ³ /min
- motor power:	≥ 2.2	kW

Pinion

- number of pinions:	1	
- number of teeth:	21	
- face width:	550	mm
- tooth surface hardness with case hardening	57-61	HRC
- tooth surface hardness depth:	5-6	mm
- agma service factor	75	
- external diameter:	671.97	mm
- machining method:	hobbing	

- finishing method:	grinding	
- Iso quality class:	6	
- Roughness in the teeth area:	1.6	Ra
- material: (as per FLS material data sheet 2233)	30CrNiMo8	(1.6580)
- blank construction method:	forging	
- hardness:	305-335	HB
- Tensile strength:	1050-1150	Mpa.
- Heat treating: (as per FLS material data sheet 2233)	Q+T	
- net weight: (approx.)	800	kg.

Pinion bearing and main shaft

- bearing type:	spherical roller bearing	
- external / internal bearing diameter:	320 / 280	mm/mm
- bearing theoretical life for design: (min.)	100,000	h
- shaft diameter (max.):	350	mm
- shaft diameter at the hub:	330	mm
- shaft diameter at the Bearing:	280	mm
- shaft length: (two sides usable)	2880	mm
- shaft material: (as per FLS material data sheet 2213)	42CrMo4	(1.7225)
- blank construction method:	forging	
- hardness:	200-240	HB
- Tensile strength:	750-900	Mpa.
- Heat treating: (as per FLS material data sheet 2213)	Q+T	
- net weight: (approx.)	1,450	kg.

2.2. High efficiency dynamic separator

2.3.1. Production rate - Calculation basis

Nominal finished product:	35 t/h
Working hours:	20 h/d (x 6 d/w)
Machine availability:	Min. %95 per year
Finished product fineness in blaine:	3800 cm ² /g with 5% residue on the 45 µm sieve

2.3.2. Technical specification

Separator type:	as vendor	
Separator size:	as vendor	
Operating system:	Closed circuit	
Circulation factor: (design/actual)	3 / ≤ 3	
Material input: (design/actual)	145 / ≤ 122.5	t/h
Tailing material: (design/actual)	110 / ≤ 87.5	t/h
Air input flow rate		
- nominal flow rate:	≥ 59,000	m ³ /h
- maximal flow rate:	≥ 68,000	m ³ /h
- actual rate rate:	≥ 35,700	Nm ³ /h
- dust content at the mill outlet:	≥ 980	g/Nm ³
Pressure drop in the separator:	≤ 200	dapa
Rotating weight:	as vendor	ton
Variable rotor speed range:	0 to 500	rpm
Power demand at motor shaft:	?	kW

2.3.3. Constructional Features

Rotor		
- rotor diameter:	~1680	mm
- rotor height:	~830	mm
- number of blades:	36 (min.)	
- blade type:	adjustable	
- blade wear plate material:	Abro 4000	
- guide vane wear plate material:	Hard faced steel 55-60 HRC	

Main body

- Output diameter:	~2400	mm
- total height:	~6000	mm
Reject valve		
- type:	Double flap valve	
- Output diameter	as vendor	mm
- height:	as vendor	mm
Lubrication device		
- type:	?	
Seal air fan:		
- air flow rate:	1500	m ³ /h
- pressure drop:	200	dapa

2.3.4. Separator drive

Motor

- power rating:	≥ 55	kW
- number of poles:	4	
- rated voltage:	380	V
- efficiency	≥ 95	%
- net weight:	?	kg

VFD

- type:	LV	
- number of pulses (if any):	?	
- Machine torque:	proportional to motor speed	

Reducer

- brand:	Flender-China	
- model type:	?	
- number of stages:	2	
- gear teeth type:	Helical	
- housing material:	spherical graphite cast iron	
- nominal power rating:	?	kW
- thermal capacity without auxiliary cooling:	?	kW
- thermal capacity with auxiliary cooling:	?	kW
- theoretical life for design:	100,000	h
- ratio:	1 : 5	

- working duty:	24	h/d
- service factor at nominal motor power:	≥ 2	
- permissible noise:	< 83	dB(A)
- lubrication method:	splash	
- auxiliary cooling type:	cooling fan	
Total separator net weight:	?	kg.

2.3. Injection water system

Water pump

- type: **flooded suction**
- nominal flow rate: **≥ 3000** l/h
- max. pressure at max. flow rate: **10** kg/cm²

Motor

- nominal power: **≥ 2.2** kW
- number of poles: ?

Flow meter type: ?

Spray nozzle type: ?

Flow control valves type: ?

Pressure gauges type: ?

Pressure switch type: ?

Pressure regulator type: ?

Flow control valves type: ?

Electrical control box type: ?

Water tank capacity: **2** m³

3. Guarantee (Expected by Saveh Cement Co.)

Guarantee period:	12 months after commissioning
Product fineness in blaine:	No less than 3800 cm ² /g with 5% residue on the 45 μm sieve
Min. capacity:	Min. 35 t/h with max. feed materials moisture content
Machine availability:	Min. %95 per year
Specific consumption of electrical energy	According to agreement or based on grindability test