
Appendix 1
Production outline and technical data of
USED COLD ROLLING MILLS

I. Raw material:

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|----------------------------|-------------------------------|
| 1.State of raw material: | hot rolled steel coils |
| 2.Texture of raw material: | low carbon steel |
| 3.Steel grade: | SPCC, SPCD, Q195LD, Q235, 20# |
| 4.Thickness: | 2.0 ~ 3.0 mm |
| 5.Inner diameter of coils: | Φ610 mm |
| 6.Outer diameter of coils: | Φ2000 mm |
| 7.Maximum coil weight: | 25t |

II. Size of finished product:

- | | |
|-----------------------------------|---------------|
| 1. Thickness of finished product: | 0.15 ~ 1.6 mm |
| 2. Inner diameter of coils: | Φ508 mm |
| 3. Width of finished product: | MAX1300 mm |
| 4. Outer diameter of coils: | Φ1900mm |
| 5. Maximum coil weight: | 25t |

III. Requirements for raw material:

No less favorable than the regulations of latest national standard (GB/T709)

Telescopicity of steel coil: ≤40mm, differ story is no more than 3mm.

The strip steel has no edge crack.

Width tolerance: nominal width 0 ~ +10mm

Camber: ≤25mm/10000mm length

Thickness deviation of incoming material is less than ± 10 % of thickness and no more than ± 0.5 mm.

I. Production process of 6-hi reversible cold rolling mill

1. Preparations before production

- ◆ Energize the motor room
- ◆ Start hydraulic equipments for normal running
- ◆ Start oil gas lubrication system for normal running
- ◆ Start technological lubrication for normal running
- ◆ Start oil removing system for normal running
- ◆ AGC

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- ◆ Normal running of AGC system
 - ◆ Start the CPC system of uncoiler for normal running
 - ◆ The intermediate roll is in the set position.
 - ◆ Each single machine is in the initial position of waiting state

2. Rolling process

2.1 Uncoiling preparation

The carbon steel strip after pickled is put on the loading stand, and the coil loading car will transport the coils to the coiling drum of uncoiler, after the coiling drum expands, the scraper of the straightening machine lifts, cuts off the bundling strap and catches the strip head, descend the press roll of uncoiler and for inching operation, send the strip head to pinch roll, depress the top pinch roll and send the strip head to straightening roll, top straightening roll will straighten the strip head and send it to hydraulic shear for shearing the irregular strip head, thus finish the uncoiling preparation.

2.2 Threading rolling

1) Equipment preparation state

Descend the back guide of straightening machine; uplift the swing guide of front machine to feeding position; switch on the movable support of left and right coiler; set the roll gap value and roll bending force according to process requirements.

2) Rolling

Send the uncoiled strip to the mill inlet via the back guide of straightening machine and front machine in the threading speed, the front centering device centers the strip steel, the swing guide of back machine will feed the strip head into the jaw of left coiler and clamps in the cooperation with press roll, meanwhile the coiling drum expands. Then the swing guide of front and back machine return to the original position, uplift the top pinch roll and top straightening roll of straightener.

Uncoiler and coiler give suitable tension and straighten the strip, inching the unit in the threading speed. Meanwhile uplift the press roll of uncoiler, descend the top roll box of oil removing device and push into thickness gauge. Open the cooling nozzle. After the left coiler winds for 2-3 rounds, give the front and back tension according to process requirements and begin to raise the speed for normal rolling. Put into AGC control after the rolling is stable.

Adjust the roll bending force and cooling nozzle according to the shape of rolled plate.

When there are only 3-5 rounds of strip left on the uncoiler, the unit slows down at threading speed; meanwhile descend the press roll of uncoiler and top straightening roll of straightener for rolling the strip tail

The strip tail withdraws the right thickness gauge before it breaks away from straightening machine; the unit stops when the distance between strip tail and roll gap is about 200mm; shut off the cooling liquid and be prepared for reversible rolling.

2.3 Reversible rolling

1) Equipment preparation state:

Uplift the guide behind straightening machine (also is the press roll of right coiler) and top roll

box of front oil removing device; uplift the swing guide of front machine to the jaw of right coiler. Set the roll gap value and adjust the roll bending force; the cooling liquid is put into reversely.

2) Rolling:

Reversely inching the rolling mill, feed the strip head into the jaw of right coiler and clamp under the combination effect of swing guide of front machine and press roll, and the coiling drum expands. Then the swing guide of front machine returns the original position. Give suitable tension to the right coiler and straighten the strip; descend the press roll of coiler. Inching the unit in the threading speed, after the right coiler winds for 2-3 rounds, uplift the press roll of right coiler, give the front and back tension according to process requirements and begin to raise the speed for normal rolling. Put into AGC control after the rolling is stable, put into right thickness gauge and descend the top roll box of right oil removing device. Adjust the roll bending force and cooling nozzle according to the shape of rolled plate. When there are only 5-7 rounds of strip left on the left uncoiler, the unit slows down at threading speed and only 3 rounds left, stop the unit; according to the pass which is specified in the rolling process regulations, repeat above operation until roll into the thickness of finished product. The advance for strip tail automatic shutdown between each pass is about 150-200mm.

2.4 Rolling of finished product

After roll the strip tail and it stops automatically, shut off the cooling liquid. Withdraw the right and left thickness gauge from the rolling line, open the top roll box of right and left oil removing box, and close the blowing device. Descend the press roll of left (or right) coiler, remove the coiling tension. Shift the positive bending cylinder of work roll to the balance state; open the roll gap to the set value required by process.

Depress the press roll of left and right coiler, meanwhile inching the rolling mill and left and right coiler in the feeding speed, when the finished strip tail reach to the crop shear, it stops, start the crop shear and shear the strip.

Inching the left and right coiler, respectively wind the finished strip and strip tail on the coiling drum of left and right coiler, bundle the strip manually.

2.5 Coil stripping

Open the movable support, drive the coil stripping car below the coiling drum; the car saddle rises, it stops after it contacts with coils. Uplift the press roll of coiler. The coiler shrinks the hole and loosens the jaw. Push plate and car will move synchronously, the car will stop when the distance between the car and rolling center is about 2000mm; uplift the coils to the highest position. Continuously transversely move the car to the fixed saddle, descend and put the coils on the fixed saddle, and the car declines to the lowest position.

2.6 Rolling with sleeve

When roll the thin strip, and the strip thickness $\leq 0.5\text{mm}$, firstly the left coil stripping car will put the sleeve on the coiling drum of left coiler, the coiling drum expands. Meanwhile, the belt wrapper moves forward to working position, the strip head stretches into the middle of belt and coiling drum; inching the unit, after wind the strip on the sleeve for 3-4 rounds and coiler builds the tension, wrapper returns to the original position for normal rolling.

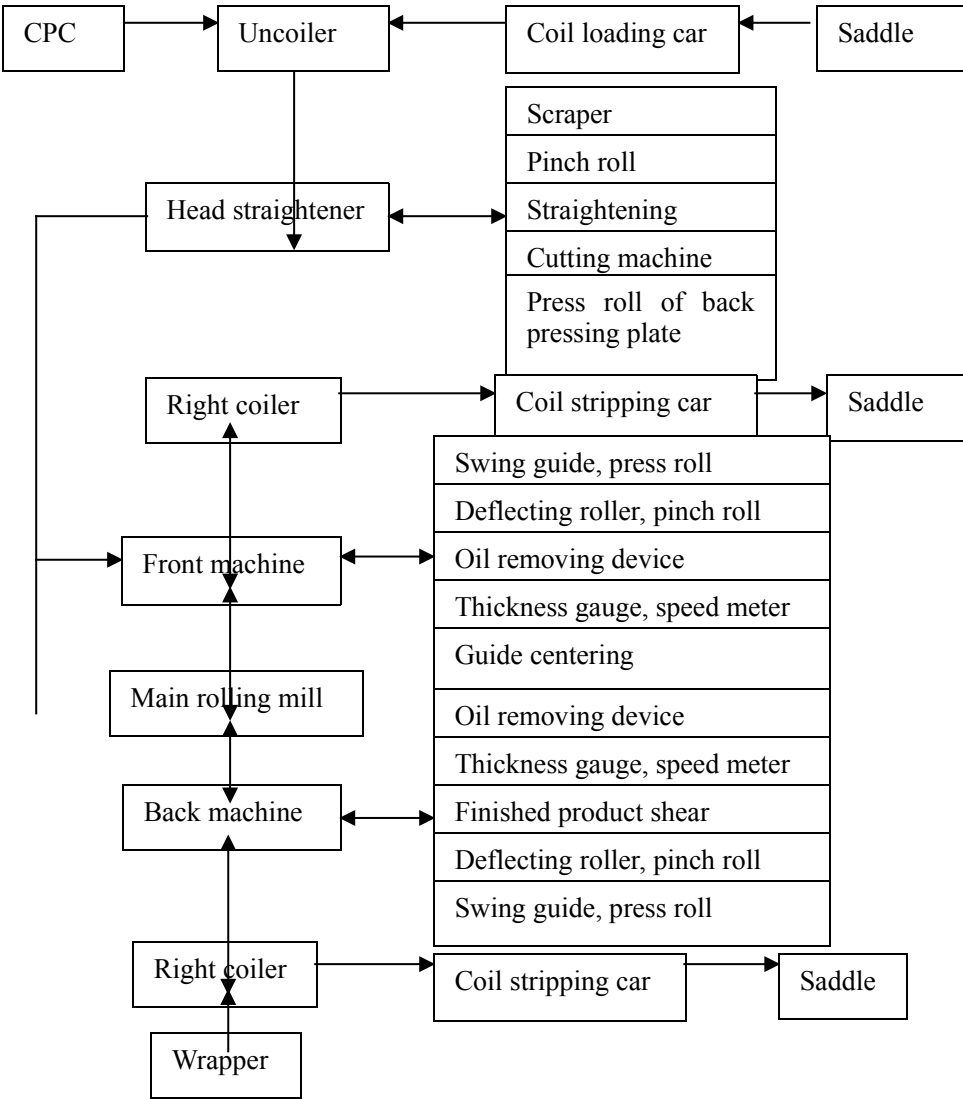
For the strip coils with sleeve, Use coil loading car to cover the coils on the coiling drum of uncoiler, the procedures of uncoiling, head straightening, feeding and threading etc. is the same

with the rolling without sleeve, strip steel passes through the rolling mill in threading speed. Then, as previously mentioned, with the help of wrapper, strip head is winded on the coiling drum sleeve of left coiler for normal rolling.

2.7 Uncoiling preparation

In the rolling process, be preparing for the head and coil uncoiling at the same time, so that the strip coil can be put into rolling quickly and reduce the auxiliary time.

Production process flow of the unit and equipment compositions is indicated in the following chart.



Appendix 8
Equipment descriptions

A. 6-high reversible cold rolling mill unit

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- ✓ Full hydraulic screwdown, hydraulic AGC automatic control (screwdown hydraulic cylinder, AGC control system, hydraulic station, thickness gauge etc. with the functions of constant roll gap position control, constant pressure control and inclination automatic adjustment control)
- ✓ Use computer automation control system, unit PLC automatic control
- ✓ Main operation table has human-machine interface, finish the dynamic picture display, the setting of rolling process parameters, fault alarm and statement printing.
- ✓ Full-digital DC drive of unit

Two work roll for independent drive

- ✓ Roll stepped cooling control and flow control

Work roll positive and negative bending control

- ✓ Preset the lateral displacement of intermediate and positive roll bending control
- ✓ CVC shifting roll technology
- ✓ Wedge zero setting

Quick work roll and intermediate roll changing

- ✓ Automatic adjustment of unit speed and tension
- ✓ Strip breakage protection, accident alarm, work roll accurate stop, coiler jaw position accurate stop
- ✓ All bearings of work roll, intermediate roll, backup roll, tension roll and deflector roll use oil-gas lubrication.
- ✓ The unit is equipped with plate shape gauge (reserved)
- ✓ Most advanced non-radioactive accurate ray thickness gauge in Germany, thickness measurement accuracy is 0.001mm.
- ✓ Roll thinnest to 0.15mm, guaranteed the size accuracy is 0.005mm.

.A Main motor power

Main rolling mill motor: N=1250kw, totally 4 sets

Motor of left and right coiler: N=1200kw, each has 2 sets, tota4 sets

Motor of uncoiling machine: N=500kw, totally 1 set

Appendix 9
Equipment list of 6-hi reversible mill unit

序□ NO.	设备名称 Equipment name	数量 Quantity	单重(吨) Unit weight (T)	总重(吨) Total weight(T)	备注 Remar k
1	Inlet coil storage table	1			
2	coil loading car	1			
3	uncoiler	1			
4	coil opener	1			
5	Head straightening machine with pinch roller	1			
6	1# tension coiler	1			
7	1# coil unloading car	1			
8	Inlet deflection pinch roll	1			
9	Thickness gauge rack	1			
10	1# squeezing roller	1			
11	6-hi reversible mill	1			
12	2# squzzing roller	1			
13	breaking shear	1			
14	Exit deflection pinch roll	1			
15	2# tension coiler	1			

16	2# coil unloading car	1			
17	Exit coil storage table	1			
18	Anchor bolt and accessories	1			
19	Equipment piping	1			
20	Process lubrication equipment	1			
21	Thin oil lubrication equipment	1			
22	Oil and gas lubrication equipment	1			
23	Mist exhaust system	1			
24	Electric automatic control system	1			