Efficiency up of operation
Quality up of products
Improvement of Plant environment

HIGH GAUSS MAGNETIC SEPARATOR

NMD
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URL : http://www.nmd.co.jp
Characteristics

**HIGH GAUSS MAGNETIC SEPARATOR.**
This machine is developed for removal of iron particles from the used coolant for cold-rolling process and Alkali cleaning solution for alkali cleaning line.

Features of HIGAMS

1. High removal ratio and able to remove of fine iron particles.
2. Able to reduce the rolling oil usage because of the efficient system.
3. Fully automated and maintenance easy.

Delivery (Sales) results

<table>
<thead>
<tr>
<th>Year</th>
<th>Customer</th>
<th>Model</th>
<th>Nos.</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987</td>
<td>JFE Steel, Chiba</td>
<td>WSF – 280 – 18a</td>
<td>1 set</td>
<td>Alkali cleaning solution</td>
</tr>
<tr>
<td>1990</td>
<td>JFE Steel, Kurashiki</td>
<td>WSF – 280 – 18a</td>
<td>1 set</td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td>Nippon Steel, Yawata</td>
<td>WSF – 280 – 18a</td>
<td>1 set</td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td>JFE Steel, Kurashiki</td>
<td>WSF – 280 – 18aV</td>
<td>3 sets</td>
<td>Rolling oil</td>
</tr>
<tr>
<td>1996</td>
<td>JFE Steel, Kurashiki</td>
<td>WSF – 280 – 6aV</td>
<td>2 sets</td>
<td>Alkali cleaning solution</td>
</tr>
<tr>
<td>2000</td>
<td>Nippon Steel, Hirohata</td>
<td>WSF – 280 – 10aV</td>
<td>1 set</td>
<td>Alkali cleaning solution</td>
</tr>
<tr>
<td>2003</td>
<td>Nippon Steel, Hirohata</td>
<td>WSF – 280 – 14aV</td>
<td>1 set</td>
<td>Rolling oil</td>
</tr>
<tr>
<td>2006</td>
<td>Nippon Steel, Hirohata</td>
<td>WSF – 280 – 18aV</td>
<td>1 set</td>
<td>Rolling oil</td>
</tr>
<tr>
<td>2007</td>
<td>Nussin Steel, Sakai</td>
<td>WSF – 280 – 18aV</td>
<td>1 set</td>
<td>Rolling oil</td>
</tr>
<tr>
<td></td>
<td>Maanshan Iron &amp; Steel</td>
<td>WSF – 280 – 18+14aV</td>
<td>2 set</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wuhan Steel</td>
<td>WSF – 280 – 18aV</td>
<td>2 set</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Baoshan Steel</td>
<td>WSF – 280 – 18aV</td>
<td>2 set</td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>Nippon Steel, Hirohata</td>
<td>WSF – 280 – 10aV</td>
<td>1 set</td>
<td>Alkali cleaning solution</td>
</tr>
<tr>
<td></td>
<td>Nippon Steel, Hirohata</td>
<td>WSF – 280 – 10aV</td>
<td>1 set</td>
<td></td>
</tr>
<tr>
<td></td>
<td>POSCO, Gwangyang</td>
<td>WSF – 280 – 18aV</td>
<td>2 set</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nippon Steel, Yahata</td>
<td>WSF – 280 – 18aV</td>
<td>1 set</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>Guangzhou JFE Steel</td>
<td>WSF – 280 – 18aV</td>
<td>3 set</td>
<td>Rolling oil</td>
</tr>
<tr>
<td></td>
<td>Shougang Qian’an Iron &amp; Steel</td>
<td>WSF – 280 – 18aV</td>
<td>2 set</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>Shougang Qian’an Iron &amp; Steel</td>
<td>WSF – 280 – 18aV</td>
<td>1 set</td>
<td></td>
</tr>
</tbody>
</table>

※Explanation of WSF-280-18aV
WSF: Wet Static Filter  280: Max flux density 2.8T(28,000G)
18: Diameter of liquid passing part (inch)  a: Air blow  V: vibrating(at cleaning)
Structure

- Cylinder (SUS304)
- Magnetic pole
  - (Steel ball)
- Inlet of air
- Outlet of rolling oil
- Inlet of hot water
- Inlet of cleaning solution
- Vibrator
- Cooling fan
- Oil分回収出口
- Outlet of recovered oil
- Drained water
- Outlet of recovered cleaning solution
- (Magnetic material)
Installation Example (Cleaning of rolling oil)

Filtration
1⇒1a Filtration
2⇒2a Oil recovery (warm water)
3⇒3a Remained water drained
4⇒4a Warm water cleaning
5⇒5a Remained water drained
6⇒6a Cleaning solution cleaning
7⇒7a Remained water recovery
8⇒8a Cleaning
9⇒9a Remained water drained

Cleaning solution cleaning
6⇒6a Remained water recovery
7⇒7a Cleaning
8⇒8a Remained water drained

Rinsing
6⇒6a Remained water recovery
7⇒7a Rinsing
8⇒8a Remained water drained

Repeat 1⇒9 above mentioned continuously as 1 batch

Rolling oil inlet ①a
Rolling oil outlet
Oil recovery outlet
Cleaning solution inlet ⑥a
Cleaning solution outlet ⑤a
Drain pit
Clean tank
Dirty tank
Recover tank
Vacuum filter
Magnetic separator
Cold rolling steel plate
Mill stand
Warm water tank
Warm water inlet
Water inlet
(Vater supply source)
Vapor inlet
Vapor supply source
Iron content
Drilled water (iron content) outlet
Rolling oil outlet
Cold rolling steel plate
Mill stand
Recover tank
Vacuum filter
Magnetic separator
Dirty tank
Clean tank
**Comparison of typical magnetic filters**

<table>
<thead>
<tr>
<th>Comparison item</th>
<th>Magnetic separator</th>
<th>Electro–magnetic filter</th>
<th><strong>H I G A M S</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Principle</strong></td>
<td>Magnetic flux is settled to the Edge of Yoke attached on N and S pole</td>
<td>Magnetic flux is settled to the Edge of magnetic pole of Expand metal, etc. in magnetic field</td>
<td>Magnetic flux leaded is settled to the contact point of balls in Magnetic field</td>
</tr>
<tr>
<td>1) absorption</td>
<td>Iron content is absorbed together with oil to the edge of Yoke easily to be stuck. And much oil is attached around Yoke.</td>
<td>Iron content is stuck together with oil to the edge of Expand–metal easily to be stuck by flux</td>
<td>Iron content is stuck to narrow contact points between iron balls as squeezing oil content</td>
</tr>
<tr>
<td><strong>2. Features</strong></td>
<td>There are two cases that coolant contact with Magnetic pole directly (direct contact) and contact through SUS (non contact)</td>
<td>SUS430 or Steel to be used The effect to sucking force is so much by Corrosion and wearing out</td>
<td>Iron(steel) ball (Bearing steel) to be used Less effect to sucking force by wearing out</td>
</tr>
<tr>
<td>1) Magnetic pole</td>
<td>Forced discharging by Scraper</td>
<td>Iron content to be discharged by water, steam (vapor and compress air etc)</td>
<td>Iron is discharged by vibrating Magnetic pole (iron /steel ball)</td>
</tr>
<tr>
<td>2) Removing the iron content stuck</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>3. Performance</strong></td>
<td>About 10% in the coolant for Ordinary steel Rate of oil and iron content is 7 : 2 0 : 1 Quantity of oil drained is very much</td>
<td>About 20% in the coolant for Ordinary steel Rate of oil and iron content is 3 : 1 Quantity of oil drained is much</td>
<td>About 40% in the coolant for Ordinary steel Rate of oil and iron content is 1 : 1 Quantity of oil drained is a little</td>
</tr>
<tr>
<td>1) Removing rate of iron content</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2) The rate of oil and iron discharged Scum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>4. Effect</strong></td>
<td>About 35～100L/hour (360L/day) (+720～2,280L/day)</td>
<td>About 15L/hour (360L/day) (+240L/day)</td>
<td>About 5L/hour (120L/day)</td>
</tr>
<tr>
<td>Quantity of rolling oil drained at Q’ty of iron content of 5 kg/ hour (compare Quantity of oil drained with it of HIGAMS)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specification</td>
<td>Model</td>
<td>WSF-280-6aV</td>
<td>WSF-280-10aV</td>
</tr>
<tr>
<td>---------------------------------------------------</td>
<td>----------</td>
<td>-------------</td>
<td>-------------</td>
</tr>
<tr>
<td><strong>Main body</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model</td>
<td>WSF-280-6aV</td>
<td>WSF-280-10aV</td>
<td>WSF-280-14aV</td>
</tr>
<tr>
<td>Current Quantity (L/min) of standard liquid</td>
<td>100~150</td>
<td>300~450</td>
<td>600~900</td>
</tr>
<tr>
<td>Diameter of inlet and outlet</td>
<td>50A</td>
<td>65A</td>
<td>80A</td>
</tr>
<tr>
<td>Cooling fan</td>
<td>0.75 kw * 1 set</td>
<td>1.5 kw * 1 set</td>
<td>1.5 kw * 1 set</td>
</tr>
<tr>
<td>Vibrating motor</td>
<td>0.25 kw * 2 sets</td>
<td>1.1 kw * 2 sets</td>
<td>2.2 kw * 2 sets</td>
</tr>
<tr>
<td>Excitation power (kw)</td>
<td>14.7 ~ 10.5</td>
<td>24.7 ~ 17.6</td>
<td>39.9 ~ 28.5</td>
</tr>
<tr>
<td>Weight of iron ball (kg)</td>
<td>80</td>
<td>220</td>
<td>550</td>
</tr>
<tr>
<td>Main body weight (kg)</td>
<td>About 3,000</td>
<td>About 7,000</td>
<td>About 11,000</td>
</tr>
<tr>
<td>Space required</td>
<td>3.0 m * 4.0 m</td>
<td>3.5 m * 4.5 m</td>
<td>4.0 m * 5.0 m</td>
</tr>
<tr>
<td><strong>Cleaning liquid tank</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model</td>
<td>WDP-4020RHS</td>
<td>WDP-7030RHS</td>
<td>WDP-7060RHS</td>
</tr>
<tr>
<td>Tank capacity (L)</td>
<td>About 600</td>
<td>About 1,800</td>
<td>About 2,400</td>
</tr>
<tr>
<td>Driving motor power of Drum</td>
<td>0.4 kw * 1 set</td>
<td>0.75 kw * 1 set</td>
<td>1.5 kw * 1 set</td>
</tr>
<tr>
<td>Electrical power of Pump</td>
<td>1.5 kw * 1 set</td>
<td>3.7 kw * 1 set</td>
<td>5.5 kw * 1 set</td>
</tr>
<tr>
<td>Main body weight (kg)</td>
<td>About 1,000</td>
<td>About 3,000</td>
<td>About 3,500</td>
</tr>
<tr>
<td>Space required</td>
<td>2.0 m * 2.5 m</td>
<td>3.0 m * 4.8 m</td>
<td>3.0 m * 5.0 m</td>
</tr>
<tr>
<td><strong>Hot water tank</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tank capacity (L)</td>
<td>-</td>
<td>About 1,300</td>
<td>About 1,700</td>
</tr>
<tr>
<td>Electrical power of Pump</td>
<td>-</td>
<td>3.7 kw * 1 set</td>
<td>5.5 kw * 1 set</td>
</tr>
<tr>
<td>Main body weight (kg)</td>
<td>-</td>
<td>About 1,200</td>
<td>About 1,300</td>
</tr>
<tr>
<td>Space required</td>
<td>-</td>
<td>2.5 m * 3.5 m</td>
<td>2.5 m * 3.5 m</td>
</tr>
</tbody>
</table>
| Scope of supply                                    | (1) For Rolling oil  
Main body, Recovering equipment of cleaning solution, Hot water tank (no need for 6aV) and control panel  
(2) For Alkali cleaning solution  
Main body and Control panel                               |
| Out-scope of supply                                | (1) Primary power supply, wiring and piping materials and works between equipment  
(2) Foundation, Installation work,  
(3) Supply pump of Filtrating solution |
| Customer 's scope of supplies                      | Utilities  
  a. Power supply  
    6aV=20kVA, 10aV=40kVA, 14aV=60kVA, 18aV=85kVA  
  b. Water. (Required quantity of water: to be discussed separately)  
  c. Compressed air  
  d. Vapor (no need for Alkali cleaning solution) |

**Remark**

* Without previous notice, above numerical values may be changed by our improvement.

* 6aV is the machine only for the test.
Design conditions for selection of Model

1. Material to be processed (Rolling oil)
   1) Object of HIGAMS using
      a. Quality up of surface of steel plate
      b. Decreasing the controlling density of iron particles
      c. Cleaning of Cooler tank
      d. Prolong of dumping out cycle
      e. Others ( )

2) Products.
   a. Kind of steel product
   b. Producing quantity ( ton/month)

3) Coolant
   a. Kind of rolling oil ( )
   b. Density of coolant ( % )
   c. Temperature ( )
   d. Consumption of coolant ( L/month )
   e. Quantity of coolant to be taken out ( )
   f. Capacity of tank ( tank )
      ( tank )
      ( tank )
   g. Management value of PH (PH ~ PH )
      regular (PH )

4) Dumping out
   a. Criterion of dumping out
      · Iron particles density
      · Density of iron particles in oil
      · Density of Oil
      · Dirt level of tank
      · Other standards, if any
   b. The cycle ( 1 time per month(s))
   c. Quantity to be charged (all or part : )

5) Iron particles
   a. Generating quantity of iron particles ( kg/day )
   b. Control target of iron particles density in coolant (less than ppm)
   c. Size of iron particles (Size distribution) ( )
   d. Control target of iron particles density in oil (less than ppm)
6) **Existing magnetic separator**
   a. Maker ( )
   b. Model ( )
   c. Type ( )
   d. Magnetic power ( )
   e. Delivery date ( )
   f. Processing flowing quantity [flow quantity of solution] ( L/min )
   g. Removing performance of iron content ( Kg/day )
   h. Efficiency of iron removing ( % )

   : Difference of solution density between inlet and outlet

   * The other equipment without magnetic separator ( )
   * Processing flow drawing for whole line ( )

7) **Investment plan**
   a. Installation place of equipment (Indoor, outdoor, underground, cellar, the other [ ] )
   b. Expected purchasing price (budget, estimated price) ( )
   c. Expected installation time of equipment ( )
   d. Consumption unit per ton of rolling oil ( )
   e. Rolling oil price ( )

8) **Others**
   a. Kind of line ( )
   b. Problem(s) ( )
   c. Is there any other iron removing equipment? ( Yes , No )

2. **Material to be processed ( Alkali cleaning solution )**

1) **Object of HIGAMS using**
   a. Quality up of surface of steel plate
   b. Decreasing the controlling density of ferrous particles
   c. Cleaning of Alkali tank
   d. Prolong of dump out cycle
   e. Others ( )

2) **Products**
   a. Kind of steel product
   b. Producing quantity. ( ton/month )
3) **Alkali cleaning solution.**
   - Kind of Alkali cleaning solution ( )
   - Density ( % )
   - Temperature ( °C )
   - Consumption of Alkali cleaning solution
   - Capacity of tank

4) **Dumping out**
   - Criterion of dumping out (Iron particles density, Oil density, Dirt of tank, Others)
   - The cycle ( 1 time per month(s))
   - Quantity to be charged (all or part: )

5) **Ferrous particles**
   - Generating quantity of ferrous particles ( kg/day )
   - Control target of iron particles in Alkali cleaning solution (less than ppm)
   - Size of iron particles (Size distribution) ( )

6) **Existing magnetic separator**
   - Maker ( )
   - Model ( )
   - Type ( )
   - Magnetic power ( )
   - Delivery date ( )
   - Processing flowing quantity [flow quantity of solution] ( L/min )
   - Removing performance of iron content ( Kg/day )
   - Removing efficiency of iron ( % )
   - Difference of solution density between inlet and outlet
     - The other equipment without magnetic separator ( )
     - Processing flow drawing for whole line ( )

7) **Investment plan.**
   - Installation place of equipment (Indoor, Outdoor, Underground cellar, The others [ ])
   - Expected purchasing price (budget, estimated price) ( )
   - Expected installation time of equipment ( )
   - Consumption unit per ton of Alkali cleaning solution ( )
   - Alkali cleaning solution price ( )

8) **Others**
   - Is there rolling oil and/or Alkali cleaning solution line without this line? ( )
   - Kind of line ( )
   - Problems ( )
   - Is there any other iron removing equipment? ( yes , no )