DLDS

Dalian Dashan Group
INTRODUCTION OF DLDS GROUP

- DLDS Group is one of the biggest producers and suppliers of crystallizer located in China. It is a joint venture with KME, the world-renowned German copper manufacture. Founded in early 1990s, it mainly consists of Dalian Dashan Crystallizer Co., Ltd, Dalian Dashan Heavy Machinery Co., Ltd, Dalian Dashan Surface Treatment Co., Ltd, Dalian Dashan Copper Industry Co., Ltd and Dalian Dashan Metallurgical Engineering Technology Co., Ltd. We have long years' supply experience of crystallizer all over the world. We also manufacture complete set of continuous casting machine and relevant spare parts acting as the main contractor. All production process are led by Quality Management System in accordance with ISO9001:2000 standards. We commit to supply products which comply exactly with customers' specifications and are competitive in terms of delivery, price and service, and we can also give technical guidance to help the customer to reduce the cost and increase productivity. Our specialized know-how, quality control and dedicated service enable us to satisfy the market’s changing requirements. We had exported our crystallizer and continuous casting machine to various foreign countries such as Germany, Italy, Greece, Brazil, Venezuela, Ecuador, India, Thailand, Philippine, Turkey, Syria, Pakistan, Egypt, South Africa, West Africa etc in last decade. For more details about our group.

- welcome to our website: www.dldsgroup.com.
Main Plant Area Of DLDS Group

Dalian Dashan Crystallizer Co., Ltd.
Main Plant Area Of DLDS Group

----Dalian Dashan Heavy Machinery Co., Ltd.
INTRODUCTION OF Dalian Dashan Metallurgical Engineering Technology Co., Ltd.

- Dalian Dashan Metallurgical Engineering Technology Co., Ltd. is the subsidiary company of Dalian Dashan Group. The company was founded in May 2008 with construction area of 40,000 square meters. There are 170 employees, of whom 36 are managers, 29 are senior technical staff. Our core business is the production of continuous casting machine, billet, slab crystallizer and relevant spare parts. The R6m casters and rolling equipment have exported abroad to Kazakhstan, Vietnam, etc.

- Dalian Dashan Metallurgical Engineering Technology Co., Ltd. is one of the import and export windows of DLDS Group.
CONTENTS

- Main Products
- Quality Assurance
- Our Target
- Main Achievements
- Contacts
Core Product - Continuous Casting Machine (CCM)
# Main Technical Parameters of High Efficiency CCM

<table>
<thead>
<tr>
<th>Description</th>
<th>Unit</th>
<th>Quadrature / Plate Billet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine type</td>
<td></td>
<td>Whole-arc gradually straighten</td>
</tr>
<tr>
<td>Arc radius</td>
<td>m</td>
<td>≥3</td>
</tr>
<tr>
<td>Billet section</td>
<td>mm</td>
<td>≥100 × 100 / ≥100 × 1500</td>
</tr>
<tr>
<td>Steel type</td>
<td></td>
<td>Carbon steel, carbon nodule steel, alloy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>nodule steel, spring steel, stainless</td>
</tr>
<tr>
<td></td>
<td></td>
<td>steel</td>
</tr>
<tr>
<td>Strand distance</td>
<td>mm</td>
<td>1100 / 1200</td>
</tr>
<tr>
<td>Withdrawing speed</td>
<td>m/min</td>
<td>≤4.0 / ≤3.0</td>
</tr>
<tr>
<td>Dummy bar</td>
<td></td>
<td>Steel flexibility (adjustable)</td>
</tr>
<tr>
<td>Mold</td>
<td></td>
<td>Spray mouth cooling / high efficiency</td>
</tr>
<tr>
<td>Vibration device</td>
<td></td>
<td>Four connecting rod, semi-board spring</td>
</tr>
<tr>
<td>Power consumption</td>
<td>Kwh/t</td>
<td>10</td>
</tr>
</tbody>
</table>
Main Parts of CCM

Ladle (incl ladleturret)
Tundish
Mould Assembly
Oscillation Device
Spray Cooling Assemble
Straightening and Withdrawal Machine
Bending and Pie Slice Segment
Foot-roller and Roller bed
Torch Cutting Machine
Copper Mould Tube, Copper Mould Plate
Mould Cooling Jacket
Level Control System
Ladleturret
Mould Assembly
Mould Assembly
Mould Assembly

Main Characteristic

Casting radius: R4000~R12000mm
Billet size: 60×60~500×500 100×240 ~300×500 φ90 ~φ500
Cooling jacket: integrated or segmented stainless steel
Water gap: 4mm (it will change as per different copper mould tube design requirement)
Water pressure: >1.0MP
Speed of the cooling water: 10-12m~16m/S
Oscillation Device
Bending and Pie Slice Segment.
Straightening and Withdrawal Machine
Foot-roller and roller bed
Our hit product—Copper Mould is the heart of continuous casting machine, we particularly introduce it hereinafter.
Copper Mould Tubes
# Copper Mould Tubes

## Specification of copper mould tube

<table>
<thead>
<tr>
<th>Item</th>
<th>Square</th>
<th>Rectangular</th>
<th>Round</th>
<th>Beam Blank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section shape</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Square</td>
<td>Rectangular</td>
<td>Round</td>
<td>Beam Blank</td>
</tr>
<tr>
<td>Size range</td>
<td>60x60~500x500</td>
<td>100x240~300x500</td>
<td>Φ90~Φ500</td>
<td></td>
</tr>
<tr>
<td>Length</td>
<td>700~1000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radius</td>
<td>R4000-R16000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal geometries</td>
<td>Parallel, single tapered, double tapered, multi-tapered, parabolic tapered, diamond tapered, CONVEX</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td>Cu-DHP (SF-Cu DIN1787)</td>
<td>CuAg0.1, CuCr-Zr</td>
<td>CuCr-Zr</td>
<td></td>
</tr>
<tr>
<td>Coating</td>
<td>Cr, Ni-Cu-Cr</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* We can design as per the customer’s specific requirements.
## Coating of copper mould tube (Cr-coating)

<table>
<thead>
<tr>
<th>Material</th>
<th>Hardness (HV)</th>
<th>Thermal Conductivity (W/m·k)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cr AMC-HC90 0.08~0.10mm(coating thickness)</td>
<td>950</td>
<td>72</td>
</tr>
</tbody>
</table>
Copper Mould Plates
## Specification of copper mould plates

<table>
<thead>
<tr>
<th>Copper plate type</th>
<th>Specifications (mm)</th>
<th>Material</th>
<th>Coating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Length</td>
<td>Width</td>
<td>Thickness</td>
</tr>
<tr>
<td>Beam Blank</td>
<td>700~1016</td>
<td>280~480</td>
<td>80~140</td>
</tr>
<tr>
<td>Rectangular</td>
<td>700~1000</td>
<td>300~3800</td>
<td>30~65</td>
</tr>
</tbody>
</table>
With the aim of helping our customer to make a more efficient use of their Copper Mould tubes, we supply mould cooling jacket, which are specially designed to match its copper mould tubes or as per the customer’s specific requirements. Our Mould cooling jacket with very small size tolerance and no distortion in time enables the water gap very uniform, and makes the cooling performance very well, then improves the product quality and increasing mould life.
Mould Cooling Jacket

**Material:**
- Stainless steel
- Copper (this is not fit for the Mould Assembly with Electromagnetic stirrer)

**Main feature:**
- A single piece without mechanical connection
- Very small size tolerance (±0.25mm)
- Non-deformable over time
- One producer for both copper mould tube and mould cooling jacket

**Our target:**
- Improving product quality
- Increasing mould life
- Reducing risk of breakout
Other auxiliary products we can supply

- Besides CCM, we can also supply coke furnace equipments:
From raw materials selecting to final inspection, in each manufacturing process, we provide full quality control to our copper mould products and production process according to ISO9001:2000 system.

- Raw materials selecting
- Tooling preparation
- Cold Drawing
- Coating
- Final finishing
QUALITY ASSURANCE FOR COPPER MOULD

**Raw materials selecting**
The elements added into the alloy, a chemical analysis of the molten metal is carried out before casting.

**Typical analysis report of the material used for copper mould tubes**

<table>
<thead>
<tr>
<th>Material</th>
<th>Unit</th>
<th>Cu-DHP</th>
<th>Cu-Ag</th>
<th>CuCrZr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical analysis</td>
<td>%</td>
<td>P 0.015~0.040</td>
<td>Ag 0.08~0.12</td>
<td>Cr 0.30~1.20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P0.004~0.012</td>
<td></td>
<td>Zr 0.03~0.30</td>
</tr>
</tbody>
</table>

**Physical properties**

<table>
<thead>
<tr>
<th>Electric Conductivity</th>
<th>%IACS</th>
<th>83</th>
<th>93</th>
<th>80</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal conductivity</td>
<td>w/mk</td>
<td>340</td>
<td>377</td>
<td>330</td>
</tr>
<tr>
<td>coefficient of thermal expansion 20-300C</td>
<td>10-6/k</td>
<td>17.7</td>
<td>17.7</td>
<td>18</td>
</tr>
<tr>
<td>Temperature for recrystallization</td>
<td>ºC</td>
<td>350</td>
<td>370</td>
<td>700</td>
</tr>
<tr>
<td>Soften temperature</td>
<td>ºC</td>
<td>-</td>
<td>-</td>
<td>500</td>
</tr>
<tr>
<td>Flexible modulus</td>
<td>103N/mm²</td>
<td>120</td>
<td>125</td>
<td>128</td>
</tr>
</tbody>
</table>
Raw materials selecting

Typical analysis report of the material used for copper mould tubes

<table>
<thead>
<tr>
<th>Mechanical properties</th>
<th>N/mm² AT20 °C</th>
<th>200 °C</th>
<th>350 °C</th>
<th>500 °C</th>
<th>350 °C</th>
<th>335 °C</th>
<th>295 °C</th>
<th>185 °C</th>
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</thead>
<tbody>
<tr>
<td>RP 0.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>N/mm²</td>
<td>285</td>
<td>250</td>
<td>195</td>
<td>30</td>
<td>275</td>
<td>245</td>
<td>190</td>
</tr>
<tr>
<td></td>
<td>AT20 °C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>200 °C</td>
<td>295</td>
<td>255</td>
<td>200</td>
<td>90</td>
<td>285</td>
<td>245</td>
<td>195</td>
</tr>
<tr>
<td></td>
<td>350 °C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>500 °C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tensile strength</td>
<td>HP 20 °C</td>
<td>20</td>
<td>9</td>
<td>10</td>
<td>40</td>
<td>17</td>
<td>13</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>AT20 °C</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td></td>
<td>200 °C</td>
<td>20</td>
<td>17</td>
<td>13</td>
<td>20</td>
<td>18</td>
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<td>20</td>
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<td></td>
<td>350 °C</td>
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<tr>
<td></td>
<td>500 °C</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Prolongation rate A5</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>AT20 °C</td>
<td>90-105</td>
<td>85-100</td>
<td>130</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>200 °C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>350 °C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>500 °C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hardness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Tooling preparation
The tooling is prepared with the Computerized Numerical Control Machining center (CNC), the accuracy can reach 0.01mm. The accuracy of the taper and all dimensions of the mould could be guaranteed.

Cold Drawing
After each time of Drawing, inspection will be taken to ensure the size within the required range, also the testing of micro structure of the metal will be carried out at laboratory.
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Our plant has equipped with complete set of production facilities and testing equipments

PRODUCTION FACILITIES
100-200T Mini-pressing machine: 3 sets
500T vertical hydraulic press: 1 set
1000T vertical pressing machine: 1 set
1500T vertical oil pressing machine: 2 sets
2000T vertical oil pressing machine: 1 set
3000T vertical oil pressing machine: 1 set
400T horizontal oil extrusion machine: 1 set
500T horizontal oil extrusion machine: 1 set
600T horizontal oil extrusion machine: 1 set
1250T horizontal oil extrusion machine: 2 sets
250T 3000x900 DMG machining center
Air compressing machine: 15 sets
Various numerical control milling machines: 22 sets
Annealing stoves: 8 sets
Hoisting equipments: 39 sets
Electric plating bath: 36Nos.
Plates coating bath: 16 Nos.
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Some pictures of production facilities
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TESTING EQUIPMENTS

HUD20 type ultrasonic crack detector
TR210 type roughness tester
HS-19GIV type and TH60 type sclerometer
Germany QUANLXR chrome-coating thickness tester
MOD-Z3 computer testing taper meter Taper tester
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Some pictures of testing equipments
QUALITY ASSURANCE FOR COPPER MOULD

Coating

Adopt advanced Germany coating technology. The electrolyte will be checked on daily basis to ensure the chemical content and the foreign substance be maintained within the required level.

The thickness scope of Chrome-coating is normally of 0.06~0.13mm. The inspection of Chrome thickness will be carried out after the coating.

Remarks:

The harmful elements for coating: such as F (from casting powder), S (from molten steel or lubrication oil), Zn & Cd (from molten steel) etc.

The influence: harmful temperature + high temperature → act on coating → to permeate basal copper → cause coating spalling → cracks on copper

Final finishing

Finish polishing to ensure the fine surface, final dimensional inspection will be carried out before packaging.
OUR TARGET

★ Good quality

★ Reasonable price

★ Timely delivery

★ Excellent after-sales service
Main Achievements of DLDS Group

Below excel sheet shows our group’s main achievements.

rectangular tube list
We prefer to discuss below detailed technical parameters should our CCM be of interest to you.

STEEL MELTING SHOP:
1. Furnace type:
2. Capacity:
3. Tapping weight:
4. Tap to tap time:

CASTER INFORMATION:
1. Machine capacity (连铸机生产能力)
2. Casting range (连铸坯尺寸范围)
3. Casting sizes (连铸机坯尺寸)
4. Caster type (连铸机类型)
5. Casting radius (连铸机弧半径)
6. Nos of strands (连铸机流数)
7. Heat size/ Tundish size (中间包容量)
8. Heats/day (炉数/日)
9. Max casting speed (最大连铸速度)
10. Strand distance (流间距)
12. Tundish car type and capacity (中间包类型和容量)
13. Molten steel temperature in Tundish (中间包钢水温度)
14. Shrouding tundish mould (连铸方式)
   submerged entry nozzle (浸入式水口) open (direct) casting (敞开式水口)
15. -A. Mould type & dimensions (结晶器类型和尺寸)
   -B. Material of copper mould.
   -C. Average lifetime of current copper mould.
16. Secondary cooling (二次冷凝系统)
   -A spray water (水冷), B air-mist spray (汽水冷却), -C computer controlled
17. Cooling water working pressure (水压)
18. Cooling water running speed (水流速)
19. Cooling water PH value (水PH值)
20. Slot between water guide pipe and Cu-tube (水缝间隙)
21. Dummy bar type (引锭杆类型): Rigid (钢性) Flexible (挠性)
22. Lubrication system (润滑系统)
   1) rape seed oil (hillet)
   2) chemistry of mold flux (plate)
23. Non-oxidation casting (无氧化浇注) Yes (  ) No (  )
   (中间包和结晶器液面自动控制) Yes (  ) No (  )
25. M-EMS and S-EMS (结晶器和电磁搅拌) Yes (  ) No (  )
26. Mould oscillator (结晶器振动装置)
27. Withdrawal straightening device & speed (拉矫装置)
   single (  ) multiple (  ) speed (  )
28. Steel grades and chemical compositions (钢种和化学成份)
Head Office:

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Thank you