GEORGIOS XIMERIS
DANIELI GROUP

2018 SEAISI CONFERENCE & EXHIBITION
25-28 JUNE 2018
JAKARTA

DANIELI UNIVERSAL ENDLESS - DUE®
THE FIRST-EVER UNIVERSAL SOLUTION FOR FLAT PRODUCTS
1. MARKET REQUIREMENTS
2. DUE® CONCEPT
3. DANIELI EXPERIENCE
4. SUMMARY
5. SGJT PROJECT
1. MARKET REQUIREMENTS

2. DUE® CONCEPT

3. DANIELI EXPERIENCE

4. SUMMARY

5. SGJT PROJECT
Strip thickness wise, the market recognizes significant extra price for thin and ultra-thin gauges.

Massive production of soft grades generates lower revenues compared to high-strength grades.
1. MARKET REQUIREMENTS

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100% ENDLESS PRODUCTION

DUE® CONCEPT

HIGH REDUCTION STANDS

FINISHING STANDS

DOWN COILERS

WD1

PS

CS

WD2

F1 F2 F3 F4 F5

LAMINAR COOLING

HSS

DC1 DC2
100% COIL-TO-COIL PRODUCTION
Caster and mill operate independently with different mass flow
Slab is cut to length by the pendulum shear at the caster, one slab for each coil

> WIDE PRODUCT MIX
> OPERATIONAL FLEXIBILITY
> BUFFER TIME

100% ENDLESS PRODUCTION
Caster is directly connected to rolling mill
Coil generated by the high speed shear before the downcoiler

> ULTRA-THIN HOT BAND DOWN TO 0.8 MM
> EXTENDED PRODUCT RANGE FOR HIGH STRENGTH GRADES
> TIGHTER PRODUCT GEOMETRICAL TOLERANCES
MERGING OF WINNING CONCEPTS

100% COIL TO COIL
> To improve existing processes / technologies
100% ENDLESS
> To overcome their limitations
> To unify in a single production line
   all winning features

DUE®

DUE® CONCEPT

DANIELI
1. HIGH PRODUCTIVITY
   Productivity of up to 3.0 Mtpy

2. ULTRA-THIN GAUGE
   Ultra-thin low carbon and thin, high strength grades

3. VALUE ADDED STEEL GRADES
   Production of thick gauge API & HSLA grades

4. LOWEST ENERGY CONSUMPTION
   Optimized OPEX and energy savings
1. **HIGH PRODUCTIVITY**

**DUE vertical-curved caster**
- Slab thickness of 110 mm after dynamic soft reduction
- 26 m containment length

**Casting speed range**
- Coil-to-coil: 2.5 to 6.5 m/min
- Endless: 4.0 to 6.5 m/min
- Optimized combination of slab thickness and casting speed
2. ULTRA-THIN GAUGE

strip thickness vs. % reduction

- 110 mm: 37% reduction
- 100 mm: 52% reduction
- 90 mm: 58% reduction
- 80 mm: 60% reduction
- 70 mm: 54% reduction
- 60 mm: 47% reduction
- 50 mm: 29% reduction
- 40 mm: 18% reduction
- 30 mm: 0.8% reduction
2. **ULTRA-THIN GAUGE**

![Diagram showing strip temperature changes over different temperatures: 1180°C, 925°C, 1175°C, 890°C, 690°C.](image)
3. VALUE ADDED STEEL GRADES

Homogenization of slab temperature before roughing

Roughing above $T_{NRX}$

Induction heater deactivated

Intensive cooling below $T_{NRX}$

Finishing below TNRX

Early accelerated cooling

Coarse irregular grain as cast

Grain refinement

“Pancaking”

Phase transformation Fine microstructure
3. VALUE ADDED STEEL GRADES
4. 
**LOWEST ENERGY CONSUMPTION**

Energy reduction DUE to selective rolling modes

**Grade**
LC

**Slab thickness**
110 mm

**Casting Speed**
5.5 m/min

**TF discharge temp**
1180°C (endless)
1150°C (coil-to-coil)
DANIELI EXPERIENCE

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> Original vertical curved thin slab caster design
> Based on more than 25 years experience
> Remarkable increase of total reduction from slab to strip thickness
> Ultra-high speed casting up to 7.0 m/min for LC steel
> Dynamic soft reduction for best inner quality
> High slab temperature at tunnel furnace entry
> Buffer time for utmost production flexibility
> Work roll change within the casting sequence
> In-house design and manufacturing by Danieli Centro Combustion
> State-of-the-art features for optimum strip shape control

> Under-load shifting system

> Separation of high-reduction and finishing stands
Why separation of high reduction and finishing stands?
> Head and tail end cuts of transfer bar
> Safe threading into finishing mill
> Higher rolling stability, especially at thinner gauges
> Reduced tail end chewing
> Consistent production of thin and ultra-thin gauges in endless rolling mode

> In-house design and manufacturing by Danieli Automation
> Intensive cooling system embedded into the descaler box at finishing mill entry

> True thermomechanical rolling of HSLA and API grades

> 380 bar high pressure for excellent surface quality
1. MARKET REQUIREMENTS
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SUMMARY
DUE® combines all advantages of endless and coil-to-coil production

1. HIGH PRODUCTIVITY
2. ULTRA-THIN GAUGE
3. VALUE ADDED STEEL GRADES
4. LOWEST ENERGY CONSUMPTION
SGJT PROJECT
首钢京唐二期多模式全连续铸轧生产线（MCCR）
项目签约仪式

Signing Ceremony of the MCCR for Phase II of the Shougang Project
Production capacity of this plant is required to be 2,100,000 ton/year of HR coils

- up to 1,500,000 ton/year in endless mode
- 600,000 ton/year in coil-to-coil mode

<table>
<thead>
<tr>
<th>SLAB SIZE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness</td>
<td>110 mm (up to 123 mm)</td>
</tr>
<tr>
<td>Slab width</td>
<td>900 - 1600 mm</td>
</tr>
<tr>
<td>Lenght (max)</td>
<td>24.5 m</td>
</tr>
<tr>
<td>Weight (max)</td>
<td>33.6 t</td>
</tr>
</tbody>
</table>
Production capacity of this plant is required to be 2,100,000 ton/year of HR coils

> up to 1,500,000 ton/year in endless mode

> 600,000 ton/year in coil-to-coil mode

**COIL SIZE**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Thickness</strong></td>
<td>0.8 - 12.7 mm</td>
</tr>
<tr>
<td><strong>Coil width</strong></td>
<td>900 - 1600 mm</td>
</tr>
<tr>
<td><strong>Specific weight</strong></td>
<td>21 kg/mm 24 kg/mm (endless only)</td>
</tr>
<tr>
<td><strong>Weight (max)</strong></td>
<td>33.6 t</td>
</tr>
<tr>
<td><strong>Coil ID / max OD</strong></td>
<td>762/2050 mm 762/2150 mm (endless only)</td>
</tr>
<tr>
<td>Group</td>
<td>Grade</td>
</tr>
<tr>
<td>-------</td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>Low carbon</td>
</tr>
<tr>
<td>2</td>
<td>Peritetic</td>
</tr>
<tr>
<td>3</td>
<td>Medium carbon</td>
</tr>
<tr>
<td>4</td>
<td>High carbon</td>
</tr>
<tr>
<td>5</td>
<td>LC MA</td>
</tr>
<tr>
<td>6</td>
<td>PE MA</td>
</tr>
<tr>
<td>7</td>
<td>MC MA</td>
</tr>
<tr>
<td>8</td>
<td>Weather resistance</td>
</tr>
<tr>
<td>9</td>
<td>TRIP/DP</td>
</tr>
<tr>
<td>10</td>
<td>Alloy steels High Cu, Cr, Ni or Mo</td>
</tr>
<tr>
<td>Width</td>
<td>%</td>
</tr>
<tr>
<td>-------------</td>
<td>----</td>
</tr>
<tr>
<td>900-1,050</td>
<td>8%</td>
</tr>
<tr>
<td>1,050-1,250</td>
<td>33%</td>
</tr>
<tr>
<td>1,250-1,400</td>
<td>34%</td>
</tr>
<tr>
<td>1,400-1,600</td>
<td>25%</td>
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</tbody>
</table>

Average width 1,283 mm
**Thin Slab Caster**
Vertical-curved type with Pendulum Shear and high pressure descaler

**Ladle Turret**

**Tunnel Furnace**
with Emergency shuttle

**No.3 High Reduction Stands**
with attached Vertical Edger and high pressure descaler

**Transfer Area**
with Crop Shear, No.9 Induction Heaters, intensive cooling and high pressure descaler

**No.5 Finishing Mill Stands**

**High Speed Shear**
and No.2 high speed downcoilers

**Laminar cooling with power and normal units**
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