“NS blade” / Advanced Air Knife for Hot Dip Continuous Galvanizing Line

NS means Nippon steel & Sumikin engineering.

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1. Difficulty of High Speed CGL Operation

- Generation of edge splash and top dross loss in High Speed Operation

As Line Speed increases, zinc-takeout pulled by strip increases.

- Generation of edge splash leads to the loss of zinc consumption.
  ① Top dross loss
  ② Difficulty in thin coating
  ③ Edge over coat
1. Difficulty of High Speed CGL Operation

- Generation of edge splash in High Speed Operation

【Operation condition】Nozzle gap: 20mm, LS: 160mpm, Gas pressure: 0.4kgf/cm²

【Operation condition】Nozzle gap: 20mm, LS: 180mpm, Gas pressure: 0.5kgf/cm²
1. Difficulty of High Speed CGL Operation

- Ordinary nozzle Jet collision issue

- Wiping gas flow
- Nozzle
- Impinging jet
- Wiping width (> Strip width)
- Strip
- Jet collision
- Splash
- edge over coating

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1. Difficulty of High Speed CGL Operation

**Baffle plate issue**

- Wiping width (> Strip width)
- Wiping gas flow
- Strip
- Nozzle
- Edge baffle plate
- Ineffective condition
- Less than 5mm
2. Features of NS blade

■ Configuration of NS blade Air knife

Cross section of nozzle

Wiping nozzle

NS blade

Wiping gas flow

Tracking

Strip
2. Features of NS blade

- **Non contact** baffle setting
  - Safety for high speed operation

- According to **the jet effect**, EOC and splash shall be avoided even at high speed operation

  *EOC: Edge over coating*
3. High speed coating test using NS blade

Schematic of experiment apparatus

- Air pressure
- Sound meter
- Nozzle
- Camera
3. High speed coating test using NS blade

Test results 1 / Edge splash (Front view and side view)

(a) Ordinary nozzle

(b) NS blade
3. High speed coating test using NS blade

Test results 1 / Edge splash (Front view and side view)

【Operation condition】
Nozzle gap: 20mm
LS: 160rpm Gas pressure: 0.4kgf/cm²

Without NS blade

With NS blade
3. High speed coating test using NS blade

Flow velocity vector
3. High speed coating test using NS blade

Test results 2/ Coating thickness distribution

Coating weight distribution (near the strip edge)

- Edge over coat
- Target
- Very little variation in the coating weight

⇒ NS blade is effective in prevent of Edge over coat and allow thin coating
3. High speed coating test using NS blade

- Test results 3/ Noise level

![Graph showing noise level comparison between Ordinary nozzle and NS blade](image)

(AP: Noise level in entire frequency band)
4. Commercial line test

- Operation condition

<table>
<thead>
<tr>
<th></th>
<th>Galvanizing Line</th>
<th>55% Aluminum+Zinc coating line</th>
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<tbody>
<tr>
<td><strong>Coil spec.</strong></td>
<td>0.23mm thick X 914mm width</td>
<td>0.35mm thick X 1200mm width</td>
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<tr>
<td><strong>Line speed</strong></td>
<td>160mpm</td>
<td>150mpm</td>
</tr>
<tr>
<td><strong>Coating thickness</strong></td>
<td>Z08(40g/m² per side)</td>
<td>AZ40(20g/m² per side)</td>
</tr>
<tr>
<td><strong>Splash</strong></td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td><strong>Overcoat</strong></td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>
4. Commercial line test

- Coating weight distribution

![Graph showing coating weight distribution for NS blade and Ordinary nozzle vs distance from strip edge. The left side shows a decrease in coating thickness, while the right side shows an increase. The graph includes data points for distances ranging from 0 to 25 mm.](image-url)
5. Conclusion

- Coating test at test line ⇒ Reduce EOC, noise level and zinc splash

Without NS blade

With NS blade

NS=1.2mm, LS=160rpm, NJ=0.4kg/cm², EB=OFF

NS=1.2mm, LS=160rpm, NJ=0.4kg/cm², EB=ON

- Commercial line operation (GI and 55% Al+Zinc bath)
  ⇒ Achieve maximum line speed and minimum coating weight operation
Thank you for your attention.