**New MIG Welding Process**

**Welding consumable and MIG process for high tensile steel and improving the fatigue strength of weld joint**

### Characteristics

- Fatigue strength of weld joint that tend to be short at high tensile steel sheet is improved.
- It’s a world’s first practical wire which is able to weld in pure Ar shield gas.
- Reasonable because of free alloy (Ni, Cr, etc.) design
- Excellent weld-ability (Non slag, low spatter, good paint-ability)

### Technology

[Society announcement; International Institute of Welding 2009 Annual Assembly]

- **MX-MIG process**: The meandering phenomenon by streaming droplet transfer mode that was not avoided conventionally at Ar shield gas is prevented by special flux cored wire. Stability arc and droplet transfer, excellent wet-ability bead shape is realized.
- **TRUSTARC™ MM-1HS**: Special consumable for MX-MIG process has hybrid action improving both below two causes that inferior fatigue strength of welding joint.
  - Stress concentration at bead toe
  - Residual stress

### Effects

- **Streaming transfer**
  - The meandering phenomenon
  - 100%Ar + Solid wire + Pulse arc

- **Droplet transfer**
  - 100%Ar + MM-1HS + Pulse arc

**Distance from border between weld and base metal (mm)**

<table>
<thead>
<tr>
<th>Distance from border between weld and base metal (mm)</th>
<th>Weld metal</th>
<th>Base metal</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
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<tr>
<td>3</td>
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</tbody>
</table>

**Residual stress (MPa)**

<table>
<thead>
<tr>
<th>Distance from border between weld and base metal (mm)</th>
<th>Weld metal</th>
<th>Base metal</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>300-400MPa</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>-100</td>
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<tr>
<td>3</td>
<td></td>
<td>-200</td>
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</tbody>
</table>

**Pull Compression**

- MM-1HS

**Solid wire + Ar80%+CO₂20% + TRUSTARC MM-1HS + 100%Ar**
Decreasing of fatigue strength by using high tensile and thin steel plate can be improved by applying MM-1HS. It contributes to light-weighting by decreasing plate thickness, improvement of the mileage and CO2 discharge reduction.

Reinforce member necessary to increase fatigue strength can be needless by applying MM-1HS. It contributes to light-weighting by decreasing reinforce member and cost-reduction by decreasing welding facilities and man-hours for that purpose.

**Examples of improving effect on fatigue strength of welding lap joint.**

**Profits**

- Decreasing of fatigue strength by using high tensile and thin steel plate can be improved by applying MM-1HS.
- It contributes to light-weighting by decreasing plate thickness, improvement of the mileage and CO2 discharge reduction.
- Reinforce member necessary to increase fatigue strength can be needless by applying MM-1HS.
- It contributes to light-weighting by decreasing reinforce member and cost-reduction by decreasing welding facilities and man-hours for that purpose.

**Process application**

Welding consumable for MX-MIG process

Conventional pulse power source

Argon gas

**Other**

- Combination of conventional solid wire and Ar80%+CO2 20%
- Spatter generation (g/min)
  - >1mm dia.
  - 0.5-1mm dia.
  - <0.5mm dia.