**INTRODUCTION**

Vertical type high speed twin roll casting

- Molten metal
- Nozzle
- Spraying
- Roll

Application: car inner panel

**Problem of Al-Mg strip**

- Al-Mg alloy has high heat crack susceptibility
  - Many cracks & fractures even in twin roll casting
- Periodical marks on strip surface
  - Muddy zone has many surface cracks unerasable by rolling

**OBJECTIVE**

- What are periodical marks?
  - Microstructural observation with SEM/OM
  - Chemical analysis with EPMA

- How are periodical marks formed?
  - Casting with differently shaped nozzle
  - Detecting melt temperature at nozzle tip

**EXPERIMENTAL PROCEDURE**

**Sample: Al-Mg alloy**

- Casting condition
  - Separating force: 11kN
  - Roll speed: 60m/min
  - Solidification length: 100mm
  - Initial roll gap: 1mm

- Microstructural analysis
  - Surface: SEM-SEI, EPMA
  - Cross-section: OM etched by Week’s reagent, Keller’s reagent

- Solidification shell
  - High Mg & crack along grain boundary to surface
  - Inverse segregation

- Globular grain
  - Thinner solidification shell
  - Lower cooling rate

**RESULTS & DISCUSSIONS**

**What are periodical marks?**

- Muddy zone
  - High Mg & crack along grain boundary to surface
  - Inverse segregation

- Shiny zone
  - Lower cooling rate
  - Residual liquid was squeezed to surface

- Muddy zone
  - Higher cooling rate
  - No residual liquid remained

**How are periodical marks formed?**

- Melt oscillation at nozzle tip causes periodical change of cooling rate

**CONCLUSIONS**

- Al-Mg alloy (AC7A) strip can be fabricated by vertical type high speed twin roll casting
- Problem: Periodical marks on the strip “Muddy zone” has many cracks indelible even after rolling
- Periodical marks: Lower cooling rate
  - Residual liquid was squeezed toward surface
  - Muddy zone
- Formation of periodical marks: Periodical melt oscillation at the nozzle tips
  - Periodical change of cooling rate