APPLICATION NOTE: Cold-Chamber Die Casting
Comprehensive sensors solution from Gefran

Overview

- **Application:** Complete solution for **monitoring the main process variables** in a cold-chamber die casting machine with the highest safety standards
- **Products: WPP-A** Magnetostrictive transducer, **KS** and **TPSA** pressure transducers, **QE1008-W** and **ML1018** strain transducers, **TC6** thermocouple
- **Results:** Comprehensive portfolio of position, pressure, force and temperature transducers of Gefran enabled effective and complete monitoring of the cold-chamber die casting process

The process

In a cold-chamber die casting process, the metal is initially melted in a separate furnace.

A precise amount of molten metal is then transferred to the die casting machine where it is ladled into a cold shot chamber (Figure 1); the metal is finally injected into the die by means of a ram driven by a compressed gas like nitrogen. Usually the cold-chamber process is employed for metals which have a high melting point (e.g. aluminium @ 660-700°C). When the workpiece is cold, the die cavity opens and the ejector pins make it fall out.

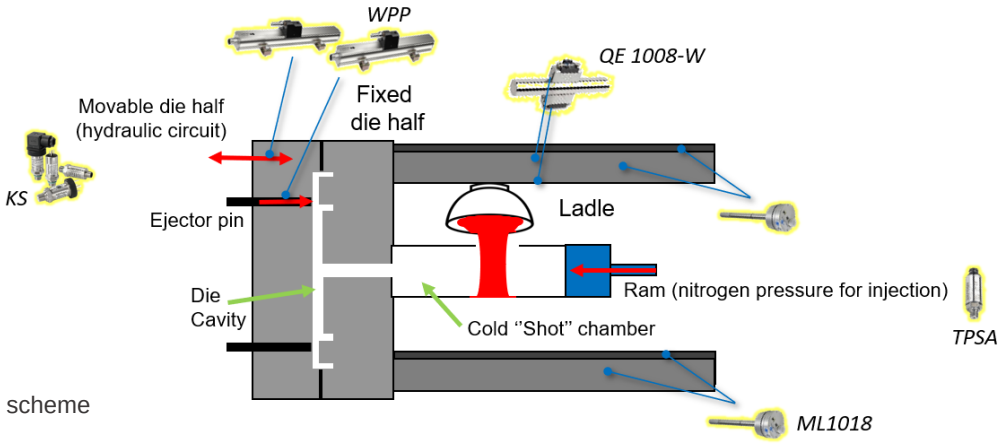

Figure 1 – Process scheme

The challenge

- This application requires a **real-time** control with excellent **resolution** and **repeatability** of several process variables such as the mould and workpiece ejector positions.
- The very fast injection system, stressing all the mechanical components of the machine requires **high resistance to shocks and vibrations**.
- Moreover, the forces impressed on the four columns supporting the moving die half (to avoid burrs in the die-cast part) must be balanced and constantly monitored at each cycle.
- Fractures in the mould or columns can raise serious safety concerns in addition to economic damage.

Product benefits

Hyperwave WPP Position Transducer

- The WPP-A Magnetostrictive transducers with a position sampling frequency of 2 kHz, equals to a reading update every 500 μs. This offers real-time position control of the main mechanical movements
- High resolution up to 0.5 μm
- Position repeatability of 0.1 mm
- Resist shocks up to 100 g, vibrations up to 15 g

KS Pressure Transducer

SIL2 certification ensures high level of safety standards

TPSA Pressure Transducer

Innovative mechanical structure makes it insensitive towards tightening – most suitable for applications calling for robust structure and high accuracy.

QE 1008-W and ML1018 Strain Sensors

- Simultaneous strain measurement of four tie bars
- Direct display of strain value
- Wireless transmission
- Easy, fast and non-destructive mounting

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Solution

Movable die half and ejector pins position control:
WPP-A Magnetostrictive position transducers – **2 Nos** (Figure 2)

- Transducer stroke: 1500 and 150 mm respectively, aluminium profile
- Cursor: Floating PCUR210
- Repeatability: 0,01 mm
- Signal linearity (error): ≤ ±0,02% FS
- Shock Resistance: 100 g
- Vibrations Resistance: 15 g

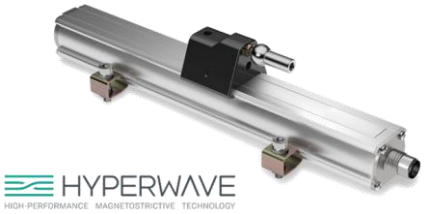

Figure 2 – Product: WPP-A Magnetostrictive Position Transducer

Oil pressure of the hydraulic circuit (250 bar):
KS pressure transducer – **1 No** (Figure 3)

Figure 3 – Product: KS Pressure Transducer

Nitrogen injection pressure (1000 bar in 3-6 ms):
TPSA pressure transducer – **1 No** (Figure 4)

Figure 4 – Product: TPSA Pressure Transducer

Mould clamping force adjustment:
QE1008-W strain sensor with wireless transmission– **8 Nos** (Figure 5)

Control of the forces applied to the four mould closing columns:
ML1018 strain sensors – **4 Nos** (Figure 6)

Figure 5 – Product: QE1018-W Force Transducers

Hydraulic circuit temperature control:
TC6 thermocouple – **1 No** (Figure 7)

Figure 6 – Product: ML1018 Force Transducer

Figure 7 – Product: TC6 Thermocouple

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