Lost Core Technology

A challenging growth opportunity.

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Trends and market needs.
Challenging future requirements.

1. Downsizing of vehicles and engines
2. Improved powertrains
3. Weight reduction

Source: International Council on Clean Transportation
**Lost Core Technology.**
*Technical Opportunities of Lost Core Technology.*

**DESIGN**
- Complex internal ducts.
- Undercuts are feasible.
- Surface quality.
- Combining different salt cores.

**TECHNICAL**
- Strengthening of designs.
- Cooling concepts.
- Internal fluid connections.
- Optimized fluid flow.

**ECONOMIC**
- Avoid shell constructions.
- Near net shape production.
- High productivity of HPDC.
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Process Chain.

1.) Part Design for salt core Application
2.) Die concept, aluminum part and salt core
3.) Filling and solidification simulation salt core and aluminum
4.) Salt core production on HPDC casting machine
5.) Aluminum part production with salt cores inlays
6.) Salt Core removing unit
7.) Worldwide support & know-how
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*Salt core - shrinkage behavior.*

- Very rapid solidification of the surface layer.
- The surface is an insulator.
- Long solidification time of the central zone.
- Shrinkage factor depends on part geometry.

Investigation of salt structure; Symposium sample.
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Possibilities - Simulation with materials salt and aluminum.

Salt Core Production
- Design of gating and venting system (salt die).
- Pre-check of shot profile
- Check of solidification.

Aluminum Casting
- Design of gating and venting system.
- Check of flow circulation around salt core.

FSI Simulation
- Fluid-Structure-Interaction: Calculation of forces affecting the salt core during filling process.
**Salt Core Simulation.**
Results of filling simulation.

- Prediction of potential air porosity.

Simulation result shows potential areas for air porosity.

Air porosity and shrinkage porosity detected in CT-analysis.
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*Process chain and necessary machines for Lost Core production.*

- **Mixing**
  - Ladler or Rauch furnace

- **Melting & Dosing**

- **Salt Core Casting**

- **Aluminum Casting**

- **Core Removing**
Process steps.
Salt core casting out of liquid phase - Movie
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Aluminum casting with salt core inlay.

- Core print in aluminium die.
  - firm or loss?

- Flow direction.
  - direct or indirect?

- Gate velocity.
  - low or high speed?

Symposium sample including gating
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Removing of salt core.

Removing with high-pressure water:

- Physical effects:
  1. Kinetic energy generated by water-jet (+ + +)
  2. Salt dissolving (+)

- Known and reliable technology.

- Worldwide availability.

Jet nozzle
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Examples - New design ideas for HPDC parts.
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**Summary.**

- Costs are reduced by minimizing assembling, machining and sealing systems.
- High automation rate of HPDC.
- Expanding the geometric freedom of HPDC parts.
- Creating completely new parts for the future.

Wherever you are – Bühler can support you with Technology and Process Know-How!
Thank you for your attention.