

INVENTORS

SHAYFULL ZAMREE BIN ABD. RAHIM^{1,2*}
 PROF. DR. SAFUAN SHARIF³
 DR. AZLAN MOHD. ZAIN⁴
 ROZAIMI MOHD. SAAD⁵
 MOHD NASIR MAT SAAD^{1,2}

CONTACT DETAILS

¹ Green Design and Manufacture Research Group, Center of Excellence Geopolymer and Green Technology (CEGeoGTech), School of Materials Engineering, Universiti Malaysia Perlis (UoMAP), 01000 Kangar, Perlis.
² Faculty of Mechanical Engineering, Universiti Teknologi Malaysia, Skudai, Johor, Malaysia
³ School of Manufacturing Engineering, Pauh Petra Campus, UoMAP, 02000 Arau, Perlis.
⁴ Soft Computing Research Group, Faculty of Computing, Universiti Teknologi Malaysia, Skudai, Johor, Malaysia
 E-mail: shayfz@uomap.edu.my

A NEW DESIGN OF CONFORMAL COOLING CHANNELS (MILLED GROOVE SQUARE SHAPE) IN INJECTION MOLDING PROCESSES



SUMMARY OF INVENTION

This new design of conformal cooling channels is specifically invented to improve the quality and productivity of injection molding process products. Milled Grooved Square Shape (MGSS) conformal cooling channels have more effective cooling surface area and are more efficient in cooling as compared to any other types of cooling channels with similar cross-sections.

ADVANTAGES OF MGSS CONFORMAL COOLING CHANNELS

- Easier to design
- Easier to fabricate
- Easier to assemble
- Reduces 13.95% to 54% of the warpage on the molded part
- Shortens cooling time up to 64.83%

PROBLEMS IN INJECTION MOLDINGS

- In designing molds;
- It is very difficult to achieve efficient cooling with uniform thermal distribution.
 - Non-uniform thermal distribution leads to warpage problem
 - Longer cooling time
 - Longer cycle time

NOVELTY OF INVENTION

- New design of conformal cooling channels, Milled Groove Square Shape Conformal Cooling Channels (MGSS).
- More effective cooling surface area compared to other types of cooling channels.
- Only single O-Ring used to seal the coolant from leakage.

COLLABORATION

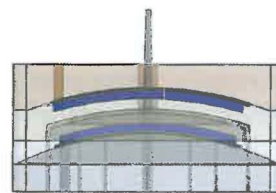


Figure 1: Core and cavity inserts with MGSS conformal cooling channels

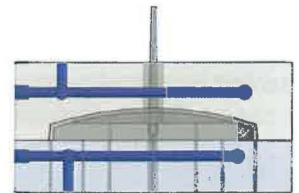


Figure 2: Core and cavity inserts with conventional straight drilled cooling



Figure 3: Core insert with MGSS conformal cooling channels disassembled



Figure 4: Slot for 'O-Ring' for MGSS conformal cooling channels at core side



Figure 5: Cavity and Core sides mold for front panel housing



Figure 6: Jig is fabricated to measure warpage on the front panel housing in x, y and z - direction



Figure 7: Coordinate Measuring Machine (CMM), Mitutoyo, used for measuring



Figure 8: Measuring warpage on the front panel housing part with CMM machine

PUBLICATION

The technical report about the invention has been published in Journal of Materials and Manufacturing Processes, Taylor & Francis (ISI Impact Factor: 1.297) and Advances in Polymer Technology (ISI Impact Factor: 1.096).

1. Z. Shayfull, S. Sharif, Azlan Mohd Zain, R. Mohd Saad, and M. A. Fairuz, Milled Groove Square Shape Conformal Cooling Channels in Injection Molding Process, Materials and Manufacturing Processes, 28: 884–891, 2013.
2. Z. Shayfull, S. Sharif, Azlan Mohd Zain, M.F. Ghazali and R. Mohd Saad, Potential of Conformal Cooling Channels in Rapid Heat Cycle Molding: A Review, Advances in Polymer Technology, 33(1), DOI: 10.1002/adv.21381, 2014.