Course Introduction
Multi-component molding (MCM) is one of the fabrication techniques to diversify the modern plastic molded products. Among various MCM technologies, two-component overmolding and insert molding are commonly applied. However, many problems are encountered due to the complicated combination of material selections, design integration, and process condition specification. For instance, warpage magnitude and its mechanism are not the same as in single-component injection molding. Is metal insert always beneficial to the warpage of final products? On the other hand, the wash-out and re-melted issues happen during the overmolding or insert molding. How can we predict these problems and provide the solutions?

Goals
- Realize what the major difference between two-component molding and single injection molding.
- Evaluate insert will be positive or negative in the processing and production for two component molding system.
- Learn how to predict residual stresses during two component molding and how to reduce them.
- Trace why the insert part will be re-melted during two component molding

Course Information
- **Date**: Please refer to official website
- **Organizer**: CoreTech System
- **Contact**: mkt@moldex3d.com
- **Remark**: Small class size of 8-10

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<th>Topic</th>
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<td>Introduction to two-component and insert molding technology and their Industrial Applications</td>
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<td>Investigation into two-component and insert molding technologies:</td>
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<tr>
<td>(A) Numerical simulation</td>
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<td>• Geometry effect</td>
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<td>• Material selection</td>
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<td>• Process condition effect</td>
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<td>(B) Experimental study and verification.</td>
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<td>Case study (1) How to predict and manage of the warpage quality through two-component molding technology for automobile instrumental panel.</td>
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<td>Case study (2) What and how the metal insert will influence the process and quality for mobile phone development.</td>
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<td>Case study (3) How to predict the residual stresses and make the solution for two-color cell phone keypads.</td>
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<td>Case study (4) To study the cause of re-melt in two component molding.</td>
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*The agenda is subject to changes.
Course Content

In this course, firstly, we introduce a brief history and industrial applications for two-component overmolding and insert molding. The key technical issues are further discussed. Moreover, the scientific CAE technique is applied to investigate the part geometrical effect, material selections, and process condition specifications systematically. Furthermore, in order to give more concrete understanding, many case studies are demonstrated. The first case study is discussed about automobile instrumental panel development. When it is manufactured by overmolding, the warpage goes more serious. We instructs how to predict the quality change and how we can modify.

In the second case, we talks about how the metal insert affects the quality of mobile phone. Specifically, how we can consider this impact from design phase to fabrication phase. Finally, since residual stresses influence the optical and warpage quality significantly, we will apply two-component molding to study the cause of residual stresses. Also, the wash-out and re-melted problems are also discussed.

(a) Geometry and runner layout for two component molding.
(b) Comparison between simulation and experimental results for two component molding system as shown in left.
(c) Instrumental panel through single injection molding: total displacement < 1 mm.
(d) Instrumental panel through two component molding: total displacement around 12 mm.
(e) Residual stresses prediction using CAE.
(f) Experimental method to evaluate residual stresses.

Participants

- Owners and managers
- Supervisors in research or production departments
- Part design/production engineers
- Mold design/manufacturing engineers
- Molding experts/engineers
- Material suppliers
- People interested in plastic products and processing
- People interested in 2k-molding/Insert-molding products and processing

Instructor

Dr. Chao-Tsai Huang

Current position: Director in Technical and Research Division of CoreTech System Education: PhD in Chemical engineering at University of Washington
Specialization: Polymer properties/Polymer processing/Plastic optical-electric part development/Optical application analysis

In the past few years, Dr. Huang and his team have devoted to polymer processing and IC-encapsulation research with success. Their services are worldwide in several professional areas including traditional injection molding, injection molding problems and solutions, multiple component molding, plastic optical product, and other special molding processes. Dr. Huang is also an expert in injection molding screw and extrusion analysis. He has helped several famous manufacturers for continuous process manufacturing including flat die, annular die, and profile die systems. He is also in charge of blow molding/thermal forming designs and their trouble shooting. Recently, Dr. Huang advocates the concept of plastic product life cycle management.