





# Heavy Machinery Design and Reverse Engineering

Case Study





### About CCE

CCE is an ISO 9001 certified, Michigan corporation, in business since 1989, with offices in Michigan, New Jersey, and India. CCE has delivered cost-effective product realization solutions through a customer-focused service model. This service model seamlessly integrates product conceptualization, design, prototyping, manufacturing, and sustaining services to our clients, worldwide.



Our flexible business model enables customers to choose any combination of our engineering and manufacturing services to accelerate their time-to-market strategy, with significant cost reduction. CCE focuses on mid-tolow volume programs, with higher complexity, characterized by products with high-tolerance, complex machining, and zero-defect expectations. CCE offers services to mechanical OEMs in the industrial/commercial, semiconductors, consumer goods, energy and utilities, aerospace, and off-highway transportation industries.

### CCE's Outsourcing Strategy

CCE's outsourcing strategy consists of three elements:

- Philosophy: Risk Management
  - Task Selection Leverage sustaining engineering to accelerate new product development
  - Task Prioritization Capacity Maturity Model
- **Resources:** Accountability, Quality and Productivity
  - Customer Interface Local program management
  - Delivery Team Dedicated offshore engineering team
- Technology: Visibility, Control and Productivity
  - Communications -Collaborative work order management system
  - Task Automation Leveraging technology to automate repeated tasks

### A detailed discussion of CCE's outsourcing philosophy is available in CCE's White Paper "Leverage Sustaining Engineering to Accelerate New Product Development"

This case study discusses how CCE's outsourcing strategy and its implementation for a client helped in creating new product designs and in modifying existing designs to reduce machining time and cost.

### Work Descripti on

The work was done for an Ohiobased client who is a manufacturer of plastic injection molding and thermoforming machines.

Client's CAD System: SOLIDWORKS

Number of CCE Engineers: 9

# CCE handled the following engineering projects for the client:

- Design Engineering of Injection Molding Machine
- Finite Element Analysis
- Reverse Engineering of Thermoforming machine

### Design Engineering of Injection Molding Machine

- Client has a range of injection molding machines based on tonnage.
- CCE completed designengineering projects for the machines listed below.

### HM460:

 Designed a new movable platen guiding assembly for HM460

### HM660:

Designed manual and poweroperated guard assembly for HM660. CCE interacted with actual assembly personnel to determine problems during operation and was able to improve design based on the feedback.





- Designed Purge Guards with latest hinge-limit switches.
  Safety of operators was the key factor during the designing of the guards.
- Designed a new movable platen guiding assembly for HM660. Client replaced old guiding assemblies at all of its customer sites.

### HM880:

- Created 3D model of complicated casting of Stationary and Movable platens, for HM880, using 2D drawings.
- Converted 2D drawings to 3D models and assemblies for HM880. CCE simultaneously modified existing design to make it easier for manufacturing, assembling, and after-sales maintenance.
- Designed new and reliable subassemblies to replace old ones.
- Modified power guard design for simplicity, ease of assembly, and maintenance.

### HM1100:

 Designed new die height nut adjusting system to replace the old system. The client replaced all of the old assemblies at customer sites with the new system.

### HM2200:

- Modified HM2200 parts to reduce machining time and cost.
- Designed new die height nut adjusting system to replace the old system. The client replaced all of the old assemblies at customer sites with the new system.

### HM2750:

 Designed a completely new machine, from scratch, using other machines, concepts, and few available details as references.

### HM3000:

- Designed Purge Guards with latest hinge-limit switches.
  Safety of operators was the key factor during designing of the guards.
- Designed new die height nut adjusting system to replace the old system. The client replaced all of the old assemblies at customer sites with the new system.
- Modified platen carrier guide assembly.
- Modified HM3000 parts to reduce machining time and cost.

### **Finite Element Analysis**

- CCE analyzed stationary platens under various loading conditions, for HM3000 using Cosmos. These results enabled the client to identify areas of stress concentration.
- CCE analyzed custom-made platens for client's customers for different platen sizes and die sizes.

Nodal Stress Analysis on Stationary Platens







### Reverse Engineering of Thermoforming machine

CCE completely reverse engineered a thermoforming machine. The machine was located at the client's site in the U.S. CCE sent four engineers to the U.S. to take measurements and pictures of the equipment. Subsequently, one engineer stayed at the customer's site and the other three returned back to CCE's engineering center in India. The four engineers collaborated on delivering the reverse engineering project.

The delivered model consisted of over 250 parts, over 40 subassemblies, and about 10 major assemblies.

Total engineering time spent on the project was 4500 man-hours.







### **Illus trations**

INJECTION MOLDING MC-HM3000-CLAMP PRESSURE MANIFOLD



INJECTION MOLDING MC-HM3000-MOVABLE PLATEN ASSY



INJECTION MOLDING MC-HM3000-STATIONARY PLATEN ASSY



INJECTION MOLDING MC-HM3000-CLAMP PRESSURE MANIFOLD





INJECTION MOLDING MC-HM3000-MOVABLE PLATEN ASSY







"Working with CCE enabled us to introduce a brand new thermoforming machine to the U.S. market.

This machine has gained wide acceptance with a major automotive OEM."

-CEO Industrial Machine Manufacturer

**CALL** +1-248-932-5295

EMAIL sales@cadcam-e.com

WEB www.cadcam-e.com