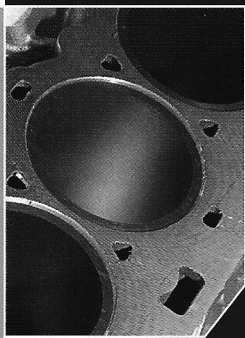
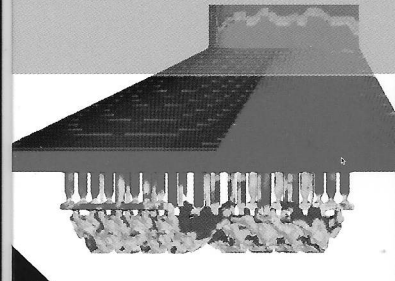
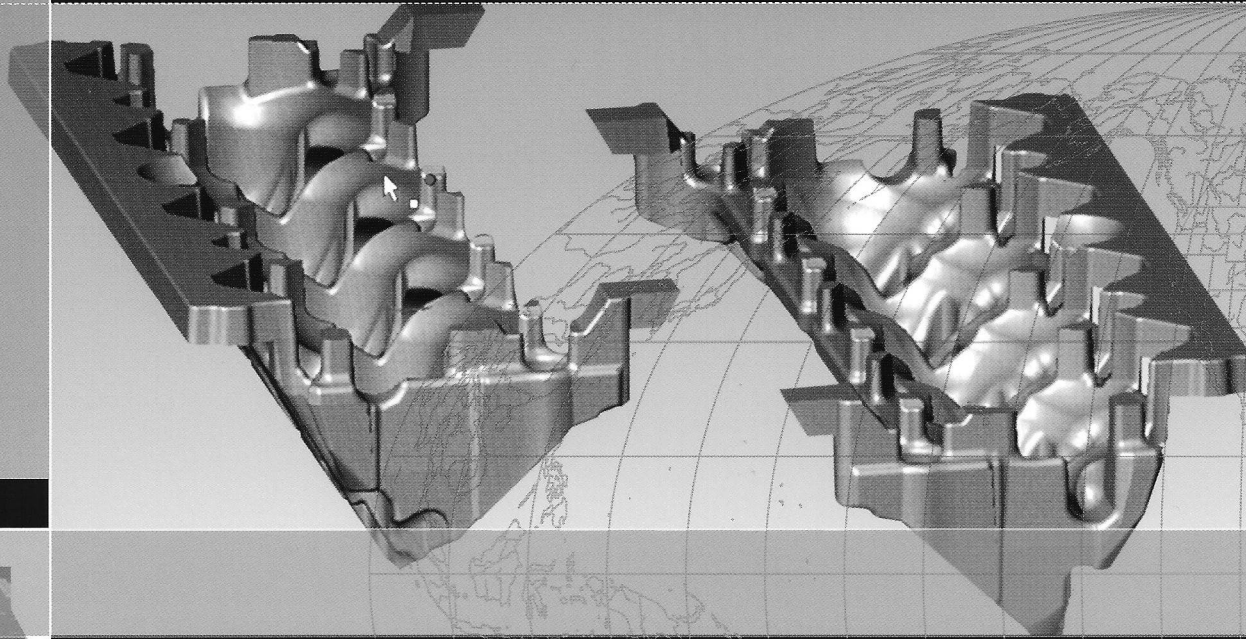


# CASTING SOLUTIONS

*Design Services: Applying Technology from Concept to Casting*

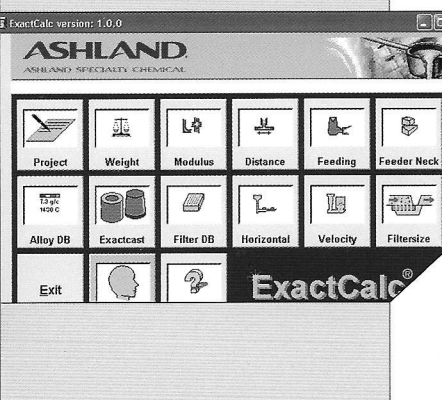
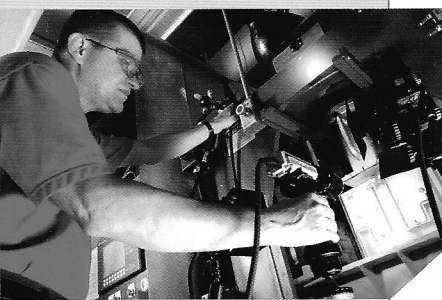
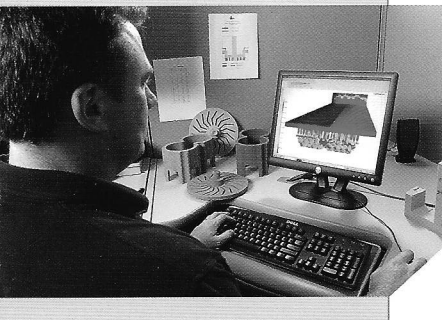
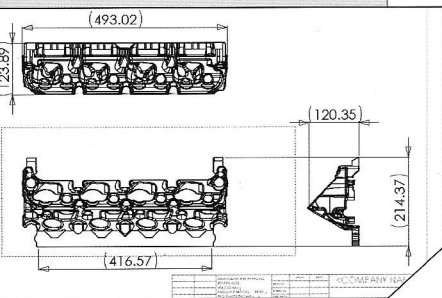


**ASHLAND®**

### Design Services – Applying Technology from Concept to Casting

Today, globalization, outsourced metal castings manufacturing, and more intricate part designs pose communication and integration obstacles to a cohesive design-to-manufacture process. Just as Ashland's Casting Solutions' cold box binder technology dramatically improved sand casting in the 1960s, our Design Services Group is now meeting the challenges of an increasingly complex and dispersed metal casting industry. Our goal: to help our customers optimize casting designs and processes to achieve flawless manufacturing.

Blending a design process that begins with interactive, animated simulation techniques, and a team of technical professionals with an unparalleled experience base in the industry, we bring precise and sophisticated state-of-the-art process analysis and control to the 5,000-year-old art of metal casting.



### From concept....

We recognize that design and manufacturing processes need to work hand-in-hand. When the two are approached independently, time and money are wasted in redesign, rework and communication failures. Our approach puts the end result in mind from the very start, and everywhere in between.

### How?

Our Design Services team works with the customer to define the specific resources and processes required as the design takes shape. We personally visit all involved sites, studying both needs and capabilities, to understand what is fixed and what is malleable in the manufacturing process, and how this impacts design parameters. Additionally, we utilize metal casting flow and solidification modeling tools to evaluate initial designs.

### To prototype....

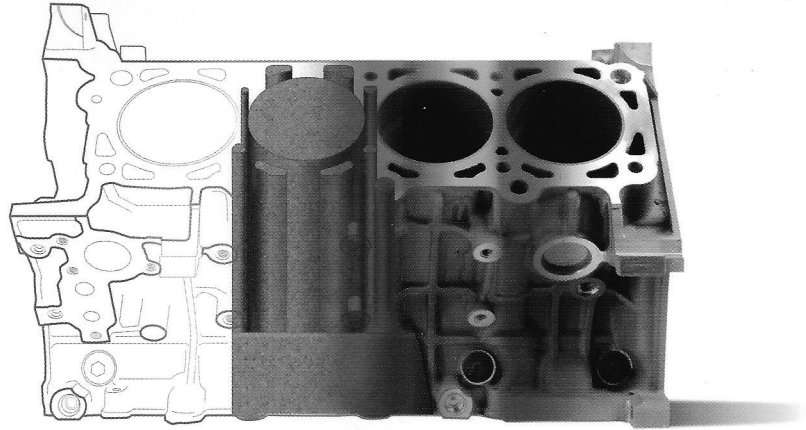
Once the compatibility factors between the design and manufacturing process are understood, materials and variables are tested virtually, before the prototype is ever built. We then create a functional prototype using a process that mirrors the customer's actual manufacturing process – from the consumable materials used in the process down to finishing. Resulting prototypes are produced on a much more rapid timeline and have higher viability from the outset.

### How?

At the customer's site or in our Dublin, Ohio facilities, we perform the virtual design and testing of prototype tooling, sand cores and molds. First, CAD renderings are produced from engineering drawings or even simple sketches. Using Arena-flow<sup>1</sup> software we then produce animated simulations of sand core blowing and gassing processes, while ExactCalc<sup>®</sup> methoding software helps determine the mold gating and risering required to optimize mold filling.

Our Technical Services Lab replicates and validates actual prototypes of the tooling, sand core and mold designs.

“Our Design Services team works to be your total solution from concept to completion. We have the ability to work with customers from engineered drawings through casting and testing in our design-to-manufacture process.”



**To manufacture ....**

Casting Solutions interfaces with both the design group and manufacturers, and assures that both are on board during the trial phase of manufacture at our prototype casting facility in Dublin, Ohio. The process is then transferred to the casting plant where the partnership between our technical team and the casting plant's engineering and manufacturing groups continue.

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**How?**

Before the casting is produced at the plant, our team conducts trial production runs in the Metals Applications Lab, and performs a battery of defect analysis and efficiency tests. When we are confident that the process optimizes materials usage and minimizes labor, scrap and emissions, our technical team trains personnel and monitors initial runs at the manufacturer's casting plant to ensure success.

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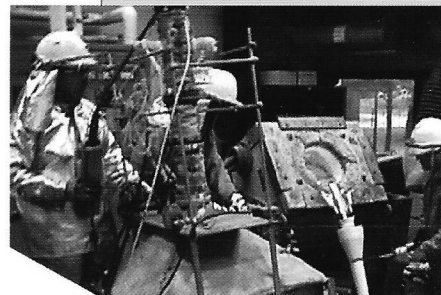
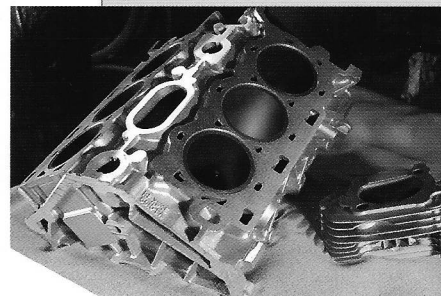
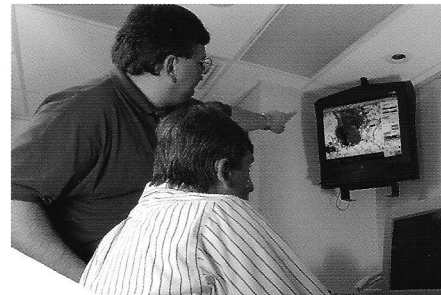
**To housekeeping ...**

A precise tool for meeting our customers' and Ashland's environmental stewardship responsibilities is embedded in the process from start to finish. Beginning with the design stage, Ashland's Casting Solutions collects data on the emissions generated during the casting process. This information may be used to drive modifications in materials or processes, and may ultimately be used to provide emissions analysis for ease in permitting and government reporting.

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**How?**

HOODSTACK® analytical services, Ashland's process emissions analysis capability, can be used to collect and process data at various stages during casting optimization.





# CASTING SOLUTIONS

## *Design Services*

### **A Virtual Revolution In Metal Casting**

- CAD takes a concept from the mind's eye to blueprint in a few short hours
- Animated 3-D pictorials bring sand core blowing, fluid flow and metal solidification to life for analysis and modification
- V 3-D printing enables rapid prototypes to be produced at any stage in the design process
- HOODSTACK<sup>®</sup> analytical services can be used to monitor every modification so that emission information is clear and concise.

### **Summary**

Ashland's Casting Solutions group continually innovates and refines value-added products and services for every casting operation need. Recognizing that our customers now have broader systems needs, we created the Design Services Group and supplied it with the best specialized resources available.

Cast metal consumers today search an ever-expanding base of options for optimal manufacturing capabilities. To compete effectively, manufacturers must continue to shrink an already narrow margin for error, whether it's in terms of rework, missed deadlines or defect ratios. Rely on Casting Solutions' Design Services to help you achieve those improvements through our integrated design-to-manufacture process, where quality assurance is built into every phase.

### **Who are the people of Design Services?**

- Engineering professionals with more cumulative experience and exposure to best practices around the world than any other casting industry supplier
- The only group in the casting consumable industry to maintain a fully-functioning metal casting facility
- The only ISO-certified technical services organization in the industry

Delivering Metal Casting Solutions – One Customer at a Time.

# ASHLAND<sup>®</sup>

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Responsible Care<sup>\*</sup>

Ashland is committed to the continuous evolution of technology and service solutions that promote health, safety and environmental protection around the world.

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