

Case Study – Product Failures with On-Shore and Off-Shore Plastic Injection Molding Suppliers

Challenge

Founded in 1855, the Sears Manufacturing Company pioneered the development of specialized seats for the agricultural, construction and industrial vehicle industries. Today, Sears Manufacturing Company is the leading manufacturer of suspension and non-suspension seating for agricultural, construction and industrial equipment and on-the-road trucks along with being the major seat supplier to Deere & Co., CNH, Caterpillar, Hyster, Yale, Freightliner, Bobcat, and many others around the world.

Quality driven with a focus on engineering, Sears contacted Clinton P. Cowen with CPC Plastics, Inc. for testing and analysis services pertaining to the vast number of increased plastic failures with a number of plastic injection molded components, manufactured in the United States, Vietnam, and China. Sears had serious concerns regarding the sheer number of increased cracking, deformation, and processing defects that they were experiencing on plastic levers, knobs, seat backs, armrests, and other assembly components used in their seating systems.

The challenge was that there were numerous plastic component failures of different sizes and designs, injection molded from many different families and grades of resins, molded at various locations throughout the world, and finally, there were different types of failures, including brittle and ductile. There simply was no consistency or pattern that one could easily pinpoint the probable fault, it required the "heavy lifting" of plastic failure analysis and an experienced team of plastic engineers.

Solution

Our engineers commissioned numerous plastic failure analysis studies to determine the type and mode of failure and with a focus on analytical material testing, injection molding process review, and microscopic analysis of fractured surfaces to gain a

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better understanding as to what may be instigating factor(s) to this significant increase in the number of plastic product failures.

Why do plastic parts fail? The primary mode, or cause, of failure for plastic parts, such as the parts subject of this Study, can be directly attributed to one or more of the following, including plastic material, design, process, and/or service use. Additionally, our work product will allow us to classify the method, or type, of failure(s) as Mechanical, Thermal, Chemical, and/or Environmental.

The method in which we preceded included a visual and microscopic inspection of the failed plastic injection molded article, 3D CAD product design analysis, Mold Flow and COSMOS Stress Analysis, and analytical material testing, such as FTIR (Fourier Transform Infrared Spectroscopy), DSC¹ (Differential Scanning Calorimetry), and Ash Content².

Subsequent to visual, microscopic, and analytical plastic testing, our plastic engineers scrutinized the testing and analysis results in full view of their plastics education, knowledge, and real-world experience working on similar products manufactured using related plastics manufacturing processes. Next, following the compilation and interpretation of these testing and analysis findings, our plastic experts evaluated the injection molding vendors production, process, and quality data, in full view of our aforementioned findings, to assess these suppliers quality control and manufacturing processes.

In parallel with our efforts pertaining to the Failure Analysis Studies and addressing ongoing plastic part and assembly failures, Clinton P. Cowen³ developed a customized training seminar for Sears Quality, Purchasing, Manufacturing, and

¹ ASTM D3417, ASTM D3418, ASTM E1356, ISO 11357

² ASTM D5630, ASTM D2585, ISO 3451

³ President, CPC Plastics, Inc.; Plastic Consultant and Plastic Expert Witness



Engineering departments, and a number of their vendors who manufactured the subject injection molded components that failed. We designed a two-day seminar to address the primary modes of failure, identified thru testing as being material, design, and injection molding manufacturing process. This technical plastics seminar provided a forum for open technical discussions and acted as a conduit, which allowed us to deliver the technical plastics information that was an important tool for each department and vendor to use in their arsenal to decrease the rate of reoccurring failure(s).

Result

After hundreds of hours worked on analytical, mechanical, microscopic, and visual analysis, coupled with on-site inspections of Sears's injection molding vendors, CPC Plastics, Inc. team of plastic experts, were able to identify the type and mode of failure and then worked with the applicable department or vendor to correct the issue(s).

Working as a team, CPC Plastics, Inc.'s plastic experts along with Sears Quality, Manufacturing, Purchasing, Engineering departments, and Plastics Suppliers, our technical plastics consultants provided the knowledge, expertise, training, and on-site field services, required to not only identify and correct their current issues but also to prevent their reoccurrence.

Unlike most plastic consultants and analytical plastic testing laboratories, CPC Plastics, Inc. specializes in large and all encompassing projects, our plastic experts lead the way, and we set the higher standards that others strive to achieve. Our plastics engineering team is comprised of plastic industry experts with years of plastics knowledge, expertise, and hands-on experience that Sears required, and it we custom tailored our plastic services to address their specific needs. Our plastic experts understand plastic from a molecular level and on a human level, because knowing what the problem is and understanding how to fix it in the real world, is two totally separate things.

With CPC Plastics, Inc.'s technical guidance and plastic expertise, Sears Manufacturing Company realized tens of thousands of dollars in savings with the reduction of reoccurring plastic product failures, coupled with the identification and



our subsequent findings regarding culpability, not to mention that we greatly decreased the potential for any associated costly product warranty claims or mandatory recalls.

If you would like the experience of plastic experts that have the technical knowledge and real world experience of working on all-encompassing projects, "call on the experts that those within the industry turn to with their toughest problems"™, **Toll Free: 866.828.0820.**

For more information, please contact us:

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