KAYSUN

INJECTION MOLDING & ENGINEERING SOLUTIONS

Industrial and Critical-Use Injection Molding Part Histories:

3 Solutions to Complex Design and Production Challenges

Competition in and across industries is steadily increasing, compelling many OEMs to bring products to market even more quickly in order to gain or sustain an advantage. Many turn to complex injection molding partners, like Kaysun, for the design and engineering expertise needed to resolve plastic part or component challenges, comply with industry mandates, innovate custom solutions and gain a critical time advantage in production.

Here are three part histories that illustrate the value-add OEMs find in their Kaysun partnerships, specifically as it relates to industrial and critical-use applications.

CASE STUDY 1:

Wearable Hazardous Gas Detector (Multi-Gas)

An OEM in the industrial personal protective equipment industry developed a handheld gas detection device that incorporated a number of advanced sensor technologies. The device housing needed to protect this delicate instrumentation and also aesthetically align with existing products in their line.

Working with an offshore vendor presented the OEM with significant challenges surrounding incoming part quality and delivery consistency. Further, this offshore molder was also unable to provide Design for Manufacturability (DfM) support that the OEM's engineering team needed to ensure quality design and production efficiencies.

KEY PROJECT FEATURES: **Design for Manufacturability (DfM), mold fill analysis, materials analysis and selection, TPE/overmolding, advanced mold construction and modifications**

KAYSUN SOLUTION

Experienced in DfM and willing to work with the OEM's engineering team for component design and development, Kaysun guided key aspects of the project including:

- Mold fill analysis to identify molding issues for the substrate and overmold
- Comprehensive materials analysis and selection of compatible rigid materials for improved moldability and reduced warpage, as well as a thermoplastic elastomer (TPE) overmold
- Development of complicated shut-offs on the substrates to prevent overmold flash and secondary assembly including ultrasonically installed threaded inserts
- Mid-development design change surrounding the addition of a third overmold material and new color, the building of a new mold for the third overmold sequence and adapting existing molds to accommodate the third TPE overmold without compromising material flow, adhesion or device shut-off functionality
- Development of strict quality control procedures for cosmetic defects in the overmolds and clear polycarbonate components

BUSINESS IMPACT/RESULTS

Kaysun's vast experience with TPE, overmolding adhesion compatibility, and industry-leading injection molding expertise was essential for successful execution of a project that included unanticipated modifications — adjustments that would have been nearly impossible for a less sophisticated molder to accomplish.

The resulting gas detection device housing was on point with:

- A rigid substrate design that improved moldability and reduced warpage
- A polycarbonate body that was robust but clear for easy-access electronics readouts
- A soft-touch TPE overmold for a sure grip and at-a-glance color identification
- Improved functionality with the addition of a highly visible and functional red "panic" button
- IP68 rating for water and dust
- Aesthetics that complemented the existing product line

CASE STUDY 2:

Kitchen Faucet Valve Body

The brass valve body contained in a kitchen faucet produced by a leading plumbing fixture supplier was introducing lead and other metals into the water supply.

To rectify the situation and bring the faucet into regulatory compliance, the supplier needed to convert select elements of the part from metal to plastic; however, the extremely tight tolerances of the part design and the high temperature plastic selected for the conversion, with a melting point at 700°F, presented significant molding challenges.

KEY PROJECT FEATURES: Metal-to-plastic conversion; Design for Manufacturability (DfM); high temperature thermoplastic injection molding; complex part shape; complex tooling; tight tolerance features

KAYSUN SOLUTION

No strangers to metal to plastic part conversions complicated by extremely tight tolerances or thermoplastics with difficult melting points, the Kaysun engineering team:

- Designed the manufacturing process to meet the tight tolerances
- Utilized a four cavity mold, leading to consistent thermoplastic performance
- Accommodated the need to unthread steel to produce the valve body
- Developed tooling that included multiple precision movings parts. Tooling components were added to reduce risk of break-downs
- Achieved repeatable product quality using the selected high temperature plastic

BUSINESS IMPACT/RESULTS

The wealth of experience Kaysun engineers possess in metal-to-plastic conversion and thermoplastics was key in:

- Accurate production of the complex molded plastic valve body in very high quantities demanded by the consumer products industry
- Eliminating concerns about water contamination, bringing the OEM into regulatory compliance
- Reducing total manufacturing costs

CASE STUDY 3:

Heavy Truck Dash Control Valve Body

An automotive OEM was experiencing significant challenges with a critical-use part responsible for directing compressed air throughout heavy truck air compression brake systems. They worked with a number of molders, but none were able to adequately or consistently address the part complexity and, therefore, could not solve the issues.

KEY PROJECT FEATURES: **Design for Manufacturability (DfM); use of sophisticated automation cell to mold, assemble and pressure test each part; complex injection molding tooling; automated quality checks (leak test)**

KAYSUN SOLUTION

The experienced and knowledgeable engineers at Kaysun carefully evaluated the valve body assembly using DfM protocols, and identified key areas — specifically, the complexity of the part shape and the necessary ultrasonic weldments — that required complicated tooling in order to meet performance and quality standards. To do so, the critical-use part was rebuilt to include:

- Multiple threaded and push-to-connect versions of tooling ports, appropriately sized by changing out tooling inserts
- A totally automated work-cell capable of handling sophisticated project requirements including: gate removal; machined-in snap ring grooves; seven plugs ultrasonically welded into place; and 100% air decay leak test at a specific psi
- Complex tooling with multiple moving parts and interchangeable inserts to create the various part numbers

To ensure quality, production of the newly conceived design includes frequent QA/QC checkpoints:

- Two parts per shift are hydrostatically pressure tested to specific psi and time requirements
- Over 50 safety-critical dimensions are inspected three times per shift
- Automated work cell air leak testing of all parts

BUSINESS IMPACT/RESULTS

Identifying and executing specific design requirements were only part of the solution Kaysun engineers brought to this project. They developed sophisticated cell automation for molding, assembly and pressure testing to ensure quality and consistency on the line and that any adjustments could be easily made without consequence to the end user. In total, this combination of expertise and execution helped Kaysun and the OEM succeed where other molder partnerships fell short.

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From design through production, the contributions of an experienced, full-service injection molder with a skilled engineering team can take the critical-use products, reputation and business of OEMs in a variety of industries to the next level. For more information on these case studies or to discuss your next project, **contact Kaysun today**.

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