

Most organizations with product development or manufacturing responsibilities must manage product change. Typically this is handled as a Change Order, Change Request, or Engineering Change Order, each of which are vital records for effectively controlling change. However, how these processes are handled vary significantly by organization and industry.

What makes for an effective change management process? A critical first step, which is often overlooked, is a Change Authorization. Basically, it is an approval to begin a change. Too often, changes are implemented with no 'authority'. This leads to several, and usually expensive, problems.

Without a controlled methodology to collect the product change request documentation and assess it for cost and implementation impacts, the result for the manufacturer could be wasted engineering and manufacturing planning time, costly tool changes, and scrap or quality spills.

A manufacturer should establish an electronic workflow process to manage the Change Authority, which will help organize the efforts of the cross-functional workforce. This is even more critical if the change affects many diverse locations or plants such as machining, painting, assembly, etc.

"Industry best practices suggest establishing a change board to assess the change information to grant an 'approval' to proceed within the change request before any work is performed," emphasized Dave Heap, Change Management System Lead at Mercury Marine. "The source of change could be engineering, manufacturing, quality, or supply chain."

For design-to-build or design-to-manufacture businesses, it is recommended to include the product program manager on the change board. For build-to-print businesses, include the primary customer liaison on the change board. These representatives should have significant input into the change approval.

A thorough change assessment process organized by the change board should include the following inquiries:

WIP — effect of change on rework, scrap, material, hardware (fasteners, etc.), and any potential schedule implications.

Tooling — change consequences on hard tools, machining programs, inspection gauges, and inspection programs. Include costs for updating hard tools, fixtures, etc., as well as manpower costs for tool engineering. Also factor in any supply chain management costs for tool-related work performed outside the organization.

Manufacturing — potential updates to manufacturing process plans, assembly tools, in-process gauging, configuration documentation, route definition, and work instructions. Include effects on operator training, as well as management costs to implement the change. In cases where manufacturing is the change initiator, include information about process or quality improvements related to the change. If new equipment is being added, in addition to cost and timing impacts, discuss the part qualification process on the new machine.

Quality — revisions to inspection planning, federal or customer mandated inspection

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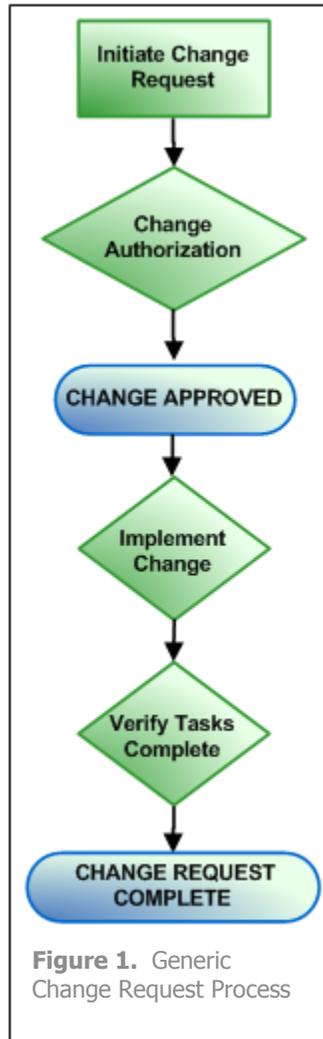


Figure 1. Generic Change Request Process

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criteria, in process validations, data collection or inspection parameters, quality reporting frequencies, etc. Include effects on inspector training and any systemic process documentation.

Supply Chain — notifications to suppliers regarding conditions of supply definition, inspection frequency, shipment requirement changes, etc. Also include any costs for expedited shipping or supplier rush charges to meet the change implementation timeline.

“Once all this information is collected, it must be analyzed by the change board to determine if the requested change implementation timeline is obtainable and if all associated change costs have been collected,” recommends Nate Hering, Engineering Standards Coordinator at Mercury Marine. Any engineering, manufacturability, supply, or quality related concerns should be addressed at this time.

Additional information to support the change decision should be captured within the change request so the change board is made aware of any final terms before approving the change authority.

In addition, these final terms must be communicated and made available to the downstream cross-functional change participants, such as manufacturing and supply chain, which may have to adjust their implementation approach. Once approved by the change board, the change can be implemented.

“Now that the change authority has been approved, the cross-functional participants from each affected plant can

begin work,” said Heap. “This may involve revising plans, work instructions, effectivity dates, quality inspections, gauging, fixtures, tools, etc.”

While the change is being implemented by the organization, approvals and work acknowledgements must be gathered at each step. To best handle this information, a change workflow is used to capture the change authority and all associated revisions and approvals. As a best practice, deliverables such as final part design, manufacturing plans, tooling designs, etc. should be locked before providing them to supply chain or the shop floor.

Examples of this include workflows to manage process planning, tooling, programming, and supply base changes. This information must be associated to the overall change request to ensure traceability. Once each cross-functional participant has completed their portion of work, an acknowledgement should be provided to the workflow so all participants know how the change implementation is progressing.

To help ensure the change implementation is complete, a final verification step should be included within the overall change process. This final verifier makes sure the planning, programming, tooling, etc. have all been production released before hitting the shop floor. This approach reduces downstream issues and prevents costly quality escapements.

This change management framework is also effective in design, design and build, and build to order environments, and for all cross-functional processes including engineering, quality, cost collection, marketing, publications and service.

(Continued on page 3)

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(Continued from page 2)

Before Mercury Marine implemented its change management workflow in Teamcenter, product change information was managed using three disparate systems with different process flows at each plant or business unit. Today there is one change process with a change board approval for all product-related change activity. Figure 2 is the change flow process currently deployed within Teamcenter.

Changes can be initiated by any person or function within the company, with review/sign-off participants at any global location. By consolidating product change into one system with a single, consistent process, the average time required for an approval has been reduced from 56 to 22 days. In addition, all documentation and product parts affected by a change are managed within the change authority. This makes change traceability available to any Teamcenter user.

“The business formed a team to design their optimum change process and created an interface mock-up,” stated Heap. “The development team was able to take that information and configure it within Teamcenter so the business could evaluate their design within the system. After a few iterations, the business team signed off and the change system went live.”

Mercury PLM Services Unique Perspective

Our differing approach concentrates on understanding your process as a must for success. A process-centric approach requires businesses to review and question existing work streams to understand “why,” “what,” and “how” work should be accomplished to establish efficient cross-functional work flows that are consistent, repeatable and scalable for growth.

We also offer a unique perspective for helping organizations considering a Product Lifecycle Management implementation because we view PLM from a manufacturing business-user’s vantage point because we live and breathe it daily.

Because we work in a dynamic, global product-development environment that supports a worldwide manufacturing footprint, we have a user’s perspective that helps drive results and realize improvements. Several of our experts also have been deeply involved with our ISO 9000 certification effort, as well as configuration management, and engineering document-management practices. Mercury PLM Services is a Siemens Zone SI Partner. ■

Figure 2. Change flow process currently deployed within Teamcenter

