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Introduction
The Engineering Change Process

Most products pass through a development period during which time the data is very volatile. In advanced technological industries such as electronics, as well as most Engineer-to-Order and Make-to-Order environments, this volatile situation may exist throughout the life of the product.

Additions to the product are made from time to time, using both existing and new parts, while other parts are deleted. Modifications range from a small change affecting a single item, to a design change involving a number of assemblies. The changes may affect the data, product definition (BOM and routing), tooling, inspection gauges, etc.

The objectives of Engineering Change Control include the capability to perform the following activities:

- verify what is to be changed
- determine the estimated cost of changes in advance so as to enable the most cost effective decision
- determine when the change is to be made, i.e., if the change is mandatory/immediate, or if it can be implemented at a later time, e.g., as existing stock of the item being replaced is depleted; and
- communicate change information efficiently and effectively throughout the organization so as to avoid the manufacture or purchase of items no longer needed, as well as to avoid the loss of production through late arrival of new parts.

To achieve these objectives the user must answer some basic questions such as which using assemblies/end items are impacted, how will this change impact end item cost, what material losses will be incurred and what work-in-process will the change affect? Answering these questions requires access to the following data:

- Bill of Material multi-level where used
- On-hand quantity and inventory value of item(s) to be replaced
- Cost and leadtime impact on using assemblies
- Purchasing commitments for the item(s) to be replaced
- Existing work in process of the item(s) to be replaced

In addition, the following functionality enhances the efficiency and cost effectiveness of the engineering change methodology:

- Capability to plan change effectivity date by the following Effectivity Types:
  - planned use-up based on user specified MPS/MRP planning cycle
  - actual use-up based on actual date of zero on hand and on order
  - serial number based on date ECN is approved
• Simulation capability to analyze alternatives for time and cost

• Hold code/stop work capability to enable stoppage of work in process

• Change pending visibility to prevent procurement or production of items no longer needed.

The stages involved in the engineering change process are:

The engineer reviews the product definition data for each usage of an affected item and obtains existing item costs, commitments and stock levels. This information provides an accurate basis for decision making and approval of the change. It answers such questions as: which end items are affected, what is the effect on end item costs, what material losses would be caused by the change, what orders currently in production are affected.

Problems arising from late or incorrect communication of changes are reduced or eliminated. For example, Purchasing is informed that an item is about to be made obsolete. Purchase Orders about to be placed can then be withheld and work on purchase orders already placed can be halted, minimizing cancellation charges. At the same time, production on released shop orders can be halted, minimizing rework.

During the implementation stage the users will be monitoring the status of activities to planned effectivity dates, serials or seiban numbers so as to coordinate the discontinuance of use of the old method or material with the start of use of the new method or material. This information enables the responsible user to monitor the change process. Measurement of planned to actual time and cost will improve the estimating of future engineering changes.

Making the Engineering Change Decision

Reasons for making an engineering change include:

• Market/Customer driven change
  A mandatory customer requirement may lead to a customer driven change. In many situations, the cost of the change is frequently negotiable as a charge back to the customer. Thus, the timeliness and accuracy of data used to estimate item availability and cost of change must be precise.

• Product improvements/Technological advances
  On-going product development and feedback from industrial engineers and field service engineers cause changes affecting the bills of material and routings.
• **Safety Considerations**  
Changes made for reasons of safety are generally considered mandatory and must be implemented immediately. If they also apply to products already in service with customers, the engineering change level, that is, item Rev or serial, as well as the customer site location of these products must be known.

• **Cost reduction**  
Improvements to process efficiencies may yield changes to routings that affect item costs, leadtimes, tools and work center loads.

Projected need dates and estimated costs will be reviewed by the individual responsible for making the change. This will be accomplished by examining the effect of a single, proposed change, as well as many alternative changes. For example, alternate materials can be introduced for an item, or a class of items, to obtain comparative cost effects. The date at which a proposed change will be implemented can be varied to discover the date yielding the lowest total cost, based on existing stocks and open purchase orders and work orders.

### Introducing the Engineering Change

The timing of engineering changes can be based on three criteria:

- **Immediate change.** If the change is mandatory, for example, elevator electrical system component failure, it is implemented without consideration for existing stock or work-in-process. The change may also involve products already shipped to customers, which may require recall, rework or field service.

- **Use-up / Stock run-out.** Timing of the change is not urgent, so stock and WIP of replaced items can be exhausted before the change becomes effective.

- **Availability of a replacement item (material, equipment, tooling).** The change cannot be implemented until the new item is available.

Engineering changes can be thought of as falling into three categories: those affecting item data only, those affecting bill of material data only, and those affecting both. For example, a dimension change for a better fit affects the specification and routing of the item without affecting the bill of material in which the item is used. On the other hand, a change in the item quantity required per assembly affects only the bill of material or structure records.

A typical change may involve many item usages and replacements, all of which must be coordinated. The actual changeover quantities and dates may vary from the plan if, for example, inventory accuracy is not correct.

The method used for controlling changes must, therefore, provide a current view of the change situation throughout the planning period. One approach is to provide a view of the current state (the old) and the future state (the new) at all times. Figure 1 represents an example.
In this way, planning for assembly A can continue throughout the change period with assurance that the system will plan the correct component.

The design cycle of a typical engineering product extends from initial design, through prototype, through production. The method of engineering change introduction is different at the various phases. The following are provided as examples:

- During the initial design phase, a decision to make an engineering change can be made by Design Engineering without impacting other departments. Since manufacturing has not yet started, it may not even be necessary to spend the time to change item numbers even if interchangeability is affected, especially since the greatest number of changes normally occurs during this period. This phase, i.e., prior to release to manufacturing, is generally addressed by the user’s CAD and PDM systems.

- During the prototype build phase, engineering changes affect the production, inspection and sales departments for certain items common to other products. The user may choose to establish and maintain the engineering BOM at this time, or wait until the engineering BOM prototype is finalized. This decision is based on planned time to market, or customer need date, and anticipated leadtime of components.

From the relationship of the engineering change data to the product definition data, the complete modification history of a product during its manufacturing cycle may need to be determined and must therefore be available. This history sets the baseline for configuration management.

- Once into production, all changes impact other departments. It is during this phase that most simulations of expected impact of change are done. Reason for change, that is, mandatory versus non-mandatory, and cost of change are major considerations for changes at this point.
Communicating the Change Information

Failure to reflect engineering changes in the product definition promptly and accurately can result in some or all of the following issues:

- the end product may not correspond to the product specified. This leads to customer dissatisfaction and the possible loss of future sales.
- the product may be incorrectly costed and thus sold at a loss.
- obsolete parts may be made, resulting in scrap or rework.
- subsequent engineering changes may be designed using inaccurate information. Correction of this situation often requires yet another engineering change.
- purchase commitments for discontinued parts are placed, resulting in cancellation costs.
- orders for the new parts are placed late, resulting in expediting costs or material shortages.

Control of engineering changes is complicated by the number of different departments involved in the planning for and implementation of each change. The volume of changes being made also impacts the user’s ability to control those changes. Much of the routine work involved can be done by the system, thus reducing the total time (and cost) required to implement an engineering change.

On implementation of the engineering change, the Product History is updated to maintain the actual change and date of change effectivity.
GLOVIA G2’s Engineering Change Functionality

Glovia’s strategic objective for the Engineering Change Control Module is that it be considered an industry leader. A summary of that base functionality includes the following features:

- User defined and maintained tables enabling the user to categorize and manage changes.
- BOM component changes enabling changes to one or more components and resulting in impacts to any number of using assemblies.
- Assembly level changes enabling visibility of impacted components and using assemblies.
- Date effectivity based on actual use-up, MRP cycle (planned use-up) or serial number.
- Cost review of estimated commitments.
- ECN pending functionality enabling management of item’s that have changes pending.
- BOM analysis of all impacted structures.
- Analysis extends to the Site Register so that impact can be viewed at all customer installations.
- Inclusive ECN History of all impacted structures enabling visibility of impacted Engineering BOMs, Estimating Local Structures, Supply Order BOMs, Customer Site Registers and ProForma Hierarchies.
- Consistent with all GLOVIA G2 functionality, service items are recognized as standard items and are therefore subject to Engineering Changes.

One additional point regarding the approach taken to GLOVIA G2’s Engineering Change Module is that the functionality is designed to enable a ‘worst case’ process model that gives a high level view of the process taken in the instance of a change requiring a Change Control Board review. This is a realistic representation of the activities involved in the change process.
The remainder of this document will elaborate on each of the aforementioned ECN features. It is important to note that, in addition to this functionality, but not included in this summary, are many smaller features enhancing the usability of the GLOVIA G2 Engineering Change Module.
Engineering Change Control Tables

The Engineering Change Control Tables provide the user tools with which to categorize and manage engineering changes. Two tables are provided for the user to define consistent with their operating environment. The user is free to define these tables as he sees fit to enhance visibility within his organization.

ECN Type Code Table

The ECN Type Code Table enables the user to define acceptable engineering change Types. Questions presented on the existing module have identified confusion as to what is meant by type of engineering change. Generally, types of engineering change are categorized as to how they are used. Types that directly impact other functions might include:

- Customer Required, to represent a change required by the customer. Although this would be a mandatory change, the user may not be liable for additional cost.
- Engineering Mandatory, to represent a change required by Design or Manufacturing Engineering. This is a frequent occurrence in ETO environments from initial design through prototype.
- QA Mandatory to represent a failure on the floor.
- FSE (Field Service Engineer) Mandatory to represent a failure in the field.
- Non-mandatory Engineering, to represent, for example, a change to product design.
- Routing Change, which could be mandatory if, for example, tooling isn't doing the job correctly, or non-mandatory if, for example, the process is being changed from manual to automated.

ECN Status Code Table

The ECN Status Code Table enables the user to define acceptable engineering change status. This applies to a change having been approved, released and implemented. Once again, the user may choose to apply a different interpretation. GLOVIA G2 provides this table, regardless of its usage, to assist the user in managing changes.

Note that Type and Status should not be confused with Disposition of existing inventory that may be replaced. Disposition as to use-up of existing stock, scrap, rework and so on, can be thought of as secondary to the type and status of change. That is, if a change is mandatory, the disposition of a replaced item’s existing inventory is relative to the cost of the change but not to the timing of the change. If a change is non-mandatory, the disposition of a replaced item’s existing inventory is relative to both time and cost.
**BOM Component Item Revisions and Additions**

Typically, new items are added to GLOVIA G2 through the use of the Engineering Workbench in the Engineering Module. GLOVIA G2 provides an alternative by allowing the user to add a new item to the database by way of the Engineering Change Workbench. This same feature also addresses the user’s need to increase the Revision of an existing item.

The ability to add and change directly from within the Engineering Change Module is considered a necessary feature. The alternative requires the user to leave the Engineering Change Module, go to the Engineering Module to add the new item, and then return to Engineering Change to complete the change by applying that new item. That inefficient process is not acceptable.

**Component Item Revisions**

Given an Engineering Change in which an item’s Revision is changing, GLOVIA G2 accommodates ease of that change by allowing the user to increase the item’s Rev, and thus add a new item, from within the Engineering Change Workbench. On making a change of this nature, the ‘old’ item’s attributes, including BOM, RTG and cost, can be copied to the new item. Should the user choose to do so, the ’Global Copy’ feature allows him to copy all static data, as well as some planning attributes, from the ‘old’ item’s Rev. The user can then modify as necessary to address the change.

**Component Item Additions**

GLOVIA G2 also allows the user to enter a new item, i.e., an item that is not replacing an existing component or increasing the Rev of an existing component, by way of an ECN.

For example, assume that the user adds an item at the component level as follows:

In this example, item B is replaced by item D. In this same change, the user wants to add item E to A’s BOM. GLOVIA G2 Engineering Change allows for the replacement of item B with item D, as well as allowing for the addition of item E (to the database, not just item A’s BOM), within the same ECN.

To enable the user to add a component to an assembly BOM regardless of replacing an existing component, a checkbox is added to the Affected Items Window. When the user checks the checkbox, this tells GLOVIA G2 that a new item is being added to the Engineering database. The user then clicks on the Replacement items window and enters the new item(s).
GLOVIA G2 will not require a replacement but will prompt the user for an old item so as to enable Global Copy should the user choose to copy all static data and change only what needs to be changed, as opposed to entering all of the static data manually.

The reason for an item to be changed by way of an ECN, as opposed to simply making the change directly to the Engineering Module, is largely a matter of company policy. However, it is generally a fairly strict policy that can now be enabled within GLOVIA G2. This functionality allows the user to make the change and apply that change to all existing structures that are impacted by that change. The user can then track change history by item or ECN.

As with component additions and changes, GLOVIA G2 Engineering Change provides one process for addition and release of new assemblies.

**Engineering Change of Assembly Items**

How a change is implemented can be a function of the product being managed. In the ETO environment, for example, the Revision of an assembly may be impacted through prototype to reflect all changes made during design, including changes to components, processes, and so on. This history of change aids in the management of configuration and enables the organization to build a solid design foundation on which enhancements to its product can be based.

GLOVIA G2's Engineering Change allows the user to apply ECNs to assembly level items from the top-down and from the bottom-up. For our purposes, the following context can be applied:

* from the bottom up means that a change is required at the assembly level due to changes made to components.

* from the top down means that a change is made to the assembly level due to a non-component change, for example, the method by which the item is processed such as manual assembly versus automated assembly.

In order to address both approaches to an assembly item change, additional functionality is provided to:

* enable the user to add a new assembly item by way of assigning a new item id to the existing assembly.

* enable the user to add a component to an assembly BOM without having to replace an existing component.

* enable the user to delete a component from an assembly BOM.
generate exception inquiries and reports listing all Engineering BOMs, Estimating Local Structures, ProForma Hierarchies, supply orders and Customer Site Registers impacted by the assembly level engineering change.

This functionality is available to all classifications of engineering change.

Consistent with change capability at the component level, GLOVIA G2 enables the user to add a new assembly item by way of assigning a new item id to the existing assembly. This new item id could be a new item number, for example, A to X, or new item Rev, for example, A Rev blank to A Rev1.

The following example applies the same structure that was used to portray a component item add. In this example, the user wants to show that the change to the component (B to B1) will impact the Assembly, resulting in a Rev change for that Assembly.

The user selects the Affected Assemblies and identifies the new item/Rev. as follows:

<table>
<thead>
<tr>
<th>Item</th>
<th>Rev</th>
<th>Set New Item</th>
<th>New Rev</th>
<th>Global Copy</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>blank</td>
<td>Y</td>
<td>A1</td>
<td>Y</td>
</tr>
</tbody>
</table>

One final example is presented to show consistency. Using the same structure, the following example portrays the instance in which a component to one item is an assembly to another:

When a new item id (number or Rev) is used, GLOVIA G2 allows for the BOM, Routing and Cost of the old item to be copied to the new item. When copying the BOM, GLOVIA G2 verifies that the BOM copied includes all Engineering changes just made. In addition, GLOVIA G2 provides the user the option to copy all static data from the old item to the new, for example, list price, customer/item cross-reference, and so on, by way of the Global Copy capability. And, finally, GLOVIA G2 allows the user to optionally select item planning data to be copied from the ‘old’ item to the new. This data includes attributes such as balloon number.

User intervention is necessarily required at this time. The user is reminded, by way of a system generated message, that on completion of a Global Copy it is imperative to run the Cost Rollover and Cost Roll-up. This reminder is reiterated in GLOVIA G2 Documentation and Education.
A note about the Site Register

The Site Register resides in the GLOVIA G2 Installation Management Module. Simply put, the purpose of the Site Register is to reflect the multi-level BOM of a product that was shipped/installed at the customer’s site. This multi-level structure represents the product “As-Shipped”/ “As-Installed”.

Whenever an ECN is approved (executed), GLOVIA G2 will review all structures, including all Site Registers, to determine the full impact of the change. The user then acts on that information to schedule Field Service Engineers for planned service calls. This allows the user to be proactive and service his customer’s product to the latest configuration, that is, the “As-Maintained”.

To put this proactive effort in context, think of an ECN created for a mandatory change. The user has few better ways to keep his customer satisfied than by preventing a problem which could result in his manufacturing line going down.
Effectivities

Effectivity is frequently stated in terms of a variable on which the date is being based. For example, when the user executes an ECN for a change to a component quantity per, he must give the ECN a date that is identified as the effectivity date. This date tells GLOVIA G2 to change impacted structures containing that component as of that effectivity date.

GLOVIA G2 allows for four classifications of engineering change:

- Quantity Per
- Replacement
- Use-Up
- Serial

When executing an ECN for a Quantity Per or Replacement change, the user tells GLOVIA G2 the effectivity date, that is, when to apply the change. In the instance of an Actual Use-Up ECN, GLOVIA G2 determines the date at which to apply the change. To execute a Serial effectivity ECN, no date is necessary as the change is applied to one or more specific Item/Serial numbers, as specified by the user, regardless of date.

Use-Up Functionality

Part of every engineering change is the determination as to when the change is to be implemented. GLOVIA G2 provides two methods of use-up functionality:

- Planned Use-Up Effectivity applies the user-designated MPS/MRP Cycle
- Actual Use-Up Effectivity applies the ‘Use-Up’ algorithm.

“Actual Use-Up” Effectivity allows the user to choose to use all existing inventory prior to initiating the plan for a replacement item. This is an effective tool for product end-of-life planning.

Actual Use-Up Effectivity applies to both on-hand and on-order inventory. That is, if the effectivity type selected is Actual Use-Up, GLOVIA G2 monitors the on-hand and on-order quantities of the item being replaced and, on it’s reaching zero, allows the user to implement the change and begin use of the new item. At this same time, GLOVIA G2 provides feedback to ECN by updating the Actual Use-Up Effectivity date, that is, the date that the change to the new item was made.
Serial Number Effectivity

GLOVIA G2 assigns a Serial Number to any item that is identified in the Engineering Item Master as requiring serial control. Serials can be automatically assigned by the system based on an odometer. Alternatively, the user can specify an item's Serial Number with a user-defined identifier.

GLOVIA G2 assigns/allows assignment of that Serial in both a proactive mode and a reactive mode. That is, the system allows the user to define at what function the Serial Number is to be assigned.

Functions at which a Serial Number can be assigned include:

- supply order release
- purchase order receipt
- work order completion

Designation as to when a serial is to be assigned to an item is done in that item's Engineering Item planning data.

Enhanced Serialization

As noted above, GLOVIA G2 allows the user to assign a Serial Number in a proactive mode, that is, on release of a supply order. Note, however, that unlike Seiban Number identification, a Serial Number is assigned after PRP, MPS or MRP has generated the planned order. As a result, components of that serialized assembly are not identified with that serial number, that is, the Serial Number is applicable to that item only, not to that item's components.

Specific considerations regarding serial assignment include:

- GLOVIA G2 applies existing, consistent functionality whenever possible. This enables the user to apply the same process to all items by way of the existing Serial Control checkbox in the Engineering Item Planning Data.
- GLOVIA G2 uses standard rules to identify when to assign the serial by way of the optional indicator in that item's Engineering Item Planning Data.
- GLOVIA G2 allows for the Serial Number used to be user defined or odometer driven.

The following is included to present an example of the Serial Number assignment at Supply Order Release.

Example: Serial Assignment at Order Release

This functionality includes the capability to identify the location and status of a serialized item at any point in time.

Given the following structure:
Assume item D is a serialized purchased part and that a quantity of 4 is needed per each item C. On releasing the PO, include the following as the PO requirements:

Item D, Serial # 701
Item D, Serial # 702
Item D, Serial # 703
Item D, Serial # 709

The user’s agreement with the vendor should include instructions stating how those items are to be identified. The items will then be received with those serials identified, as opposed to the serials being identified on receipt of the PO. In this way, GLOVIA G2 knows the location (vendor) and status of each serialized item.

**ECN by Serial Effectivity**

Engineering Change by Serial Number Effectivity means, simply put, that GLOVIA G2 must now look for item/serial, and apply an ECN effective as of the specified Serial Number. The following is included as an example of the impact of Serial Effectivity on Engineering Change.

Example: Engineering Change to look for item / serial

Given the previous example, assume a mandatory ECN on item D. This ECN calls for the replacement of item D with Item F, to be effective as of Serial number 703. The following will occur:

The Engineering Change indicates that the PO is at the vendor and that vendor has completed item D, Serial 701. The user will generally create a PO Change Notice that must advise the vendor to complete and ship item D, Serial 702 per the existing PO. The user also includes that the vendor is to change that PO per ECNxxx, where ECNxxx replaces Item D, Serials 703 and 709 with Item F, Serials 710 and 712.

**Serial Traceability and Multi-Level Tracking**

- **Multi-Level Tracking**

  In the ETO environment, the user is frequently required to fully track the location and status of a serialized item. In our example, assume the user is required to track item D, Serials 701 & 702, and item F, Serials 710 & 712. For this to be possible, it will also be necessary for the user to identify items C and A as serialized. If items C and A are not serialized, the user would not know which item C contains those specific serialized items, or which item A contains that item C.

  
  ![Diagram]

  To enable this functionality, GLOVIA G2 allows for the tracking of item/serial from component to assembly. In addition, GLOVIA G2 allows the user to enter a serialized item and view that item’s serialized components, and their respective item’s serial numbers. To enable GLOVIA G2 to execute this functionality while maintaining efficient processing times, the following Rule has been established:
Rule: Supply Orders with quantity equal > 1 must be manually maintained by the user. This is to be done by way of a ‘selection window’, i.e., a window that lists all serials currently associated with the Item /WO from which the user must choose the serial to be associated with each individual item.

- **Serial Traceability**

   The intent of this feature is to provide visibility and traceability of a serialized item’s as-built configuration, i.e., the component items issued to each serialized assembly.

   This is done by way of windows that, on entry of a Work Order Number, the serialized end item and its serialized components are listed. If the Work Order Quantity is > 1, the following example portrays how this functionality is envisioned to look to the user.

   Similarly, on entry of an Installation Order, all serialized Material List items associated with that IO, as well as the serialized components of the IO BOM, can be displayed. The following example is applicable to both in the instance of the supply order being greater than 1.

**Serial Traceability for a Work Order with quantity >1:**

<table>
<thead>
<tr>
<th>Work Order File:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work Order #123</td>
</tr>
<tr>
<td>[Assembly] Item 1A1</td>
</tr>
</tbody>
</table>
| Qty. Required = 15
| Qty. Complete = 5 |
| Serial No. ▼ |

<table>
<thead>
<tr>
<th>WO Issue File:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Issues to WO# 123</td>
</tr>
<tr>
<td>Component Item</td>
</tr>
<tr>
<td>1P1</td>
</tr>
<tr>
<td>1P2</td>
</tr>
<tr>
<td>1P3</td>
</tr>
<tr>
<td>1A1 Qty. =5</td>
</tr>
<tr>
<td>1A1</td>
</tr>
<tr>
<td>1A1</td>
</tr>
<tr>
<td>1A1</td>
</tr>
</tbody>
</table>

The intent of this window is to show the components that were issued to a Serialized Assembly

<table>
<thead>
<tr>
<th>Component / Issue Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1P1</td>
</tr>
<tr>
<td>1P2</td>
</tr>
<tr>
<td>1P3</td>
</tr>
</tbody>
</table>

- Issue Qty. should always equal Default Qty., with user override capability
- Default Qty. Equals assembly Qty. Completed divided by Component Qty. Issued
- Component Qty. Issued is to be rounded down

Note: A component may be a serialized assembly item in and of itself. Thus, the situation may arise in which a serialized item is a component of a serialized item.
The capability to list the components of that serialized subassembly greatly enhances our position on as-built configuration.

As work progresses on Work Order #123, an engineering change is approved and released to replace item 1P1 with item 1C1. Date effectivity of this ECN is consistent with the release of WO#123 for the next assembly item 1A1. Our "windows" are changed to reflect the latest data, including the engineering change, as indicated below: Cost Review of Estimated Commitments

**Engineering Change for that same Work Order:**

- **Work Order File:**
  - Work Order #123
  - [Assembly] Item 1A1
    - Qty. Required = 15
    - Qty. Complete = 6
  - Serial No.

- **WO Issue File:**
  - Total Issues to WO# 123
    - Component Item
      - 1P1: 10
      - 1C1: 2
      - 1P2: 18
      - 1P3: 12
  - 1A1 Qty. = 5
  - Assign Serials
    - 1A1: 1001
    - 1A1: 1002
    - 1A1: 1006

Item 1P1 & 1C1 reflect the engineering change.
Cost Review of Estimated Commitments

One of the variables that the user needs to review prior to executing an engineering change is the expected cost of that change. GLOVIA G2 provides a means whereby the user can, optionally, view the existing standard cost of the item to be changed. A window containing item, quantity on hand, quantity on-order, standard cost and extended cost at standard is portrayed. An example of this window follows:

Example:

<table>
<thead>
<tr>
<th>Line</th>
<th>Item</th>
<th>Quantity On - Hand</th>
<th>Quantity On - Order</th>
<th>Standard Cost</th>
<th>Extended Value at Std. Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>0001</td>
<td>1</td>
<td>100</td>
<td></td>
<td>$1.00</td>
<td>$100.00</td>
</tr>
</tbody>
</table>

On - Order Detail

<table>
<thead>
<tr>
<th>Line</th>
<th>PR/PO/WO</th>
<th>Line</th>
<th>Quantity</th>
<th>Value at Std. Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>0001</td>
<td>PO12345</td>
<td>0003</td>
<td>25</td>
<td>$25.00</td>
</tr>
</tbody>
</table>

Recall that the intent of the cost review is to provide the user with timely input to aid his decision as to executing the change. If the change is engineering mandatory, this cost review provides data as to cost of design or quality. If the change is customer required, this cost of change is an estimate as to additional charges for the customer.

Note that cost analysis in ECN is provided at the component level only. Impact to cost of an assembly change should be done using the Estimating Module.
Inclusive ECN History

GLOVIA G2 provides the tools with which the user can designate a manual change made to any structure that is initiated by an ECN. These changes then become part of the ECN transaction history. This functionality aids the user in closing the gap by generating feedback and thus providing one location for all ECN information. The intent is to have all ECN History maintained in one place.

The following graphic portrays a high level flow of the feedback of manual changes that is provided to ECN to ensure that ECN History is inclusive:

The scope of ECN auto update consists of only unreleased supply order BOMs, that is, WO, SWO and IO BOMs. This is considered a valid and reasonable update because the user is working directly with the BOM when making the Engineering change.

At this same time, ECN has reviewed other usages and generates a report of released and in-process WOs, SWOs, IOs, CSOs, PRs, POs and Repetitive Schedules. The user, then, manually applies changes to release and in-process orders.

The ECN (transaction) History is updated for all changes made as a result of a specific ECN. Thus, ECN History will include all changes, system and manual, made as a direct result of an ECN. This includes changes to Local Structures, ProForma Hierarchy’s, Site Registers and Automotive Supplier Release Schedules.

GLOVIA G2 Documentation and Education reminds the user that supply / demand analysis is done by PRP, MPS and MRP. As a result, the impact of the ECN, including changes made to PRs, will not be visible until the planning systems have been executed.
Service Items

Consistent with all GLOVIA G2 functionality, Service items are recognized as standard items and are therefore subject to Engineering Changes. ECN functionality is applied to Service Items using functionality consistent with that applied to Material Items.

Keep in mind, however, that Service Items are always single level. Changes to Service Item BOM components therefore, will always be made to Material Items. Note that, in the instance of a Service item supply order type IO, the structure referenced for ‘roll-up’ of an Engineering Change is the IO BOM, not the IO Material List. Primarily, the Routing will be the variable that changes for a Service item. In addition, users can add new Service items using Engineering Change and take advantage of the Global Copy features.

ECN Pending

An ECN Pending checkbox is maintained in the Engineering Workbench and the Material and Service Item Planning Policies and Standards Window in the Engineering Module. This checkbox identifies for the user that an ECN is pending for the item being entered. This field is maintained by glovia G and is triggered any time that an ECN has been submitted but has not yet been approved and released.

When an Engineering Change is pending for an item, the system will warn a user that there is a proposed change in many transactions. Where the actual warning is generated can be specified on a company by company basis. Typically warnings are needed at:

- Requisition and Purchase Order generation or maintenance
- Receiving
- Planning
- Material Issues
- Manufacturing Order generation or maintenance
- Manufacturing Completions
- Within the Engineering Change module
- Contracts, Sales and Quotes
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