Title: Implementing Oracle Discrete manufacturing in an Engineer to Order environment

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Executive Summary

Companies today are moving towards customized products in the Discrete Manufacturing space. Engineer to Order (ETO) is an environment that is becoming very relevant in today's context. Corporations are looking for ways and means to reduce lead times for processing of ETO Orders. They are looking for ways and means to take help of existing ERP systems in their organizations to help reduce some of pain areas in ETO Manufacturing.

Traditionally, ERP systems like Oracle have been weak in mapping ETO Order processing functionality and associated processes to standard available out of the box features and functionality. This is mainly due the complexities arising out of processing orders in the ETO Environment.

This paper elucidates how the base features of Oracle Manufacturing were enhanced to provide a solution for the organizations trying to process ETO Orders.

Characteristics of typical Engineer to Order Environment

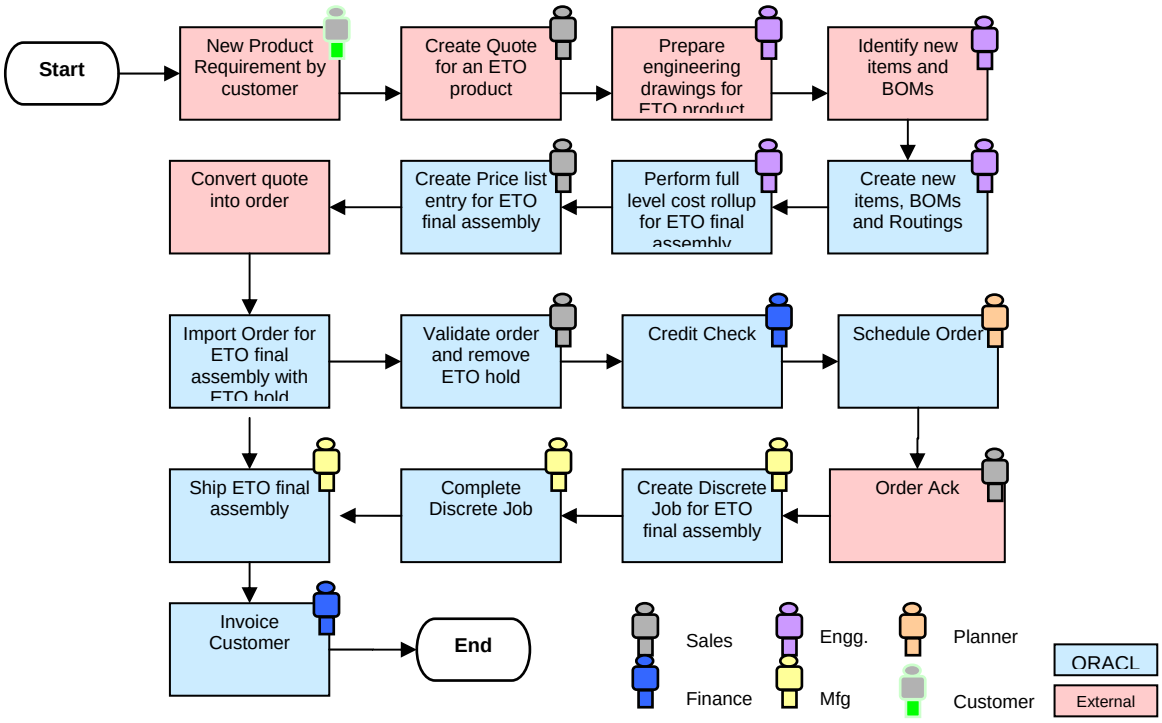
- High customer involvement in Design of the product
- Long lead times for order processing and fulfillment
- Design changes throughout the life cycle of product manufacturing
- The Order to Cash cycle may be preceded by a Quote
- The BOM and Routing of the product is not frozen at Order Entry
- The product to be manufactured may be in a project environment where the costs may be tracked onto a project
- Custom Engineering calculations may be required to be performed before the Bill and the Routing are frozen
- Sometimes the BOM and Routing may change even after production has started

ETO Environments mapping in Oracle E-Business Suite

The typical ETO Environment can be mapped onto Oracle E-Business Suite using the following two methods

1) **Standard ETO Order Processing**
2) **ETO Order Processing in a Project Manufacturing environment**

ETO Order Processing Process Flow



Typical Challenges faced in an ETO Environment

Any typical ETO Order Processing cycle will comprise of broadly two stages viz. the Pre Quote Stage and the Post Quote Stage.

- **Pre-Quote Stage**
  - Estimating for the ETO Order
  - Multiple feeder Product Life Cycle Management systems from which data needs to be consolidated and manipulations done to create the Bills, Routings and Costs for the ETO Product
  - May also involved Prototype Production to validate
- **Post Quote Stage**
  - Orders need to be put on hold to finalize the design and then freeze the BOM and the Routings
  - Lower turnaround times for Build
  - The Bill and the Routing may change after the WIP Job is released
  - In a Standard Costing environment huge variances may occur between the Standard and Actuals

ETO Order Processing in Project Manufacturing Environment

A typical project manufacturing environment is characterized by the following

- A typical project environment is one where the design, delivery and post-delivery activities include a combination of products and services engineered specifically to provide a unique solution for the customer.
- The other characteristics of this business are
  - Long execution times with the normal duration ranging from 2-5 years
  - Large capital spends and longer time-to–profit
  - Involvement of the Engineering functions (Design, Prototyping and Testing) throughout the lifecycle of the project
  - Higher levels of risk across technical solutions, costs and timelines

Typical Industries where this is used include

- Aerospace & Defense industries
- Infrastructure Development and Construction
- Process Control and Automation for Manufacturing and Utility Plants

Challenges in the Project Manufacturing environment for processing ETO Orders

- Visibility and control of the work breakdown structure, budgets, revenues, task status and other Key Performance Indicators (KPI) across various business functions.
- Cost Capture and assignment to the project from various modules like Purchasing, WIP, Service and Finance (Timecards and Expense Reports)
- Integration between project management applications and the supply chain to ensure control and optimum fulfillment of project demands

Oracle Project Manufacturing supports the following key areas

- Project manufacturing sales management and fulfillment, costing, Advanced supply chain planning.
- Project manufacturing procurement and shop floor execution, including Flow Manufacturing integration
- Assemble-To-Order and Pick-To-Order environments

Features to support Project Manufacturing in 11i and R12

1. Ability to create a project and tasks to track the product manufacturing cycle
2. Ability to create a project and tasks and capture the Project and Task when entering the Sales Order.
3. Ability to capture additional segments in the locator flexfield for capture of Project and Task information
4. Ability to set items to hard reservations so that every supply is linked to a specific demand
5. Ability to capture project and task at the WIP Job level
6. Ability to collect costs by project

ETO Order Processing in non-Project Environment

- This is typically employed by organizations that manufacture Engineer to Order products based on customer specifications but they typically don't use projects to track the product manufacturing
- In most cases a design close to the product being requested by the customer would have been manufactured before but there would be significant effort in designing for their current order as well
- This would involved creation of new items, Bills and Routings as part of the design process before the order is progressed
- The actual Bill and Routing for the ETO Product may eventually change based on changing requirements from the customer through the Order to Ship process
- Typical Industries in this non project space include:
    a. Industrial Manufacturing units
    b. Custom Electronic Equipment Manufacturing

Challenges in the standard ETO Processing Environment

- Bills and Routings change after the Job is released to the floor
- Engineering hours spent on the design is so significant that it needs to be somehow built into the product standard cost as direct labor cost
- Costing accounting does not want to see variances in all ETO Jobs. Some organizations keep rolling up the standard cost till job is completed
- Product lead times management
- Complex Materials purchase
- Planning for raw materials
- Integration between CAD and ERP Systems

Supported Features

1. Orders can be put on Engineering Hold automatically based on input parameters to the Order Holds API
2. Oracle Engineering is used to support the ECO Workflow
3. Oracle Engineering is used to create prototype items, Bills and Routings
4. Oracle PLM CAD integration to help designers view changes and quickly integrate the changes in the CAD package to the ERP system
5. Semantic search in PLM for Catalog Category based search
6. Oracle Quoting to support creation of Quotes
7. Oracle Configurator to select options for the ETO product

Solutions to some of the Gaps in ETO Order Processing

- Automatic Holds on Sales Orders based on certain conditions that are fulfilled using Holds API. The logic for this could be derived from
- Engineering calculations that are run automatically which put the Order Line on Hold
- One of the options in the configurator selects an item that puts the item on hold based of an Item attribute or flexfield setup
- Automatic Notification to Engineer when the Order is put on hold
- Custom program to release holds based on certain conditions that are fulfilled
- Customization of ECO Workflow to notify and execute certain actions for work to be done for the ECO by the concerned departments

Typical Benefits reaped by companies who implemented the ETO Solution

- Cycle time reduction in processing ETO Orders
- Coordination among various departments involved like Engineering, Purchasing and Operations to schedule ETO Orders in advance using the ECO Workflow
- In a ETO Project based scenario the costs for the ETO Order are collected onto a project
- Oracle PLM solution implementation helped to reduce the cycle time for creation of Items, BOMs and Routings for new ETO Orders
- Semantic search/ attribute catalog category based search capabilities helped designers to search for already existing BOMs/Items in the system to make sure the new item being created did not exist in the system

The Road Ahead

- Backward and Forward integration between ERP and CAD systems
- Better estimation capabilities for ETO Orders the pre-quote stage
- Whenever an ETO Order is to be manufactured using Project Manufacturing there are way too many steps required in Projects area to process the same. Need is for a simpler interface
- Enhanced search capabilities for Designers to search for ETO Items, BOMs and Routings
- Standard Costing capabilities to support ETO manufacturing capabilities