

Automated Enterprise Resource Planning Using Total Production Control System

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Abstract

Enterprise Resource Planning (ERP) is used in many business purposes, for back office functions, like human resources, technology and many other services. It is used in many areas of business such as project management, supply chain management, Manufacturing, finance & accounting, and data services. Total Production Control System (TPCS) is an ERP software. TPCS is a unique ERP application exclusively designed for the leather garments/accessories/footwear industry. There are many features and benefits in TPCS ERP. In TPCS ERP the operational flow starts from Sales order processing, Material planning, Purchase order, Inventory and finally Production. The Sales order processing is done by Logistics department in which the following processes takes place Buyer order, Internal order, Internal order raw material requirement (IORMR). The Material planning is done by store person in which Material Requirement Planning (MRP) process takes place. The Purchase order is done by Purchase Department in which the following process takes place Indent, Approved price list and finally Purchase order. The Inventory is maintained by Store person in which Goods Receipt Note (GRN) and Issue process takes place. The Production is maintained by Production department in which Daily Production Status (DPS), Finished Goods Transfer Note (FTN), Packing slip and Shipment processes takes place. The future of many leather manufacturing companies is based on ERP.

Keywords: Enterprise Resource Planning, Total Production Control System, Material Requirement Planning, Goods Receipt Note, Internal order raw material requirement.

INTRODUCTION

Enterprise Resource Planning (ERP) is used in many business purposes, for back office functions, like human resources, technology and many other services. It helps to automate many functions by integrating many applications [1-3].

It is also used in many areas of business such as project management, supply chain management, Manufacturing, finance & accounting, and data services. [4, 5]

Government also taken ERP to public sectors called GRP, for many government functioning. Many companies to implement

ERP have developed its own software applications, to integrate many departments across the company [6, 7,8]. For e.g., if a company has many departments such as HR, IT, finance, etc and each department has optimization of its own. ERP collects data and links each other so that each other department will have update about the other department inside the company [9, 10].

TPCS is ERP software. TPCS stands for Total Production Control System. TPCS is well known in the industry for its custom fit, yet easily integrated and maintained solution with world class support [11, 12]. It is a unique ERP application exclusively designed for the leather garments/accessories/footwear industry. It incorporates best business practices to tackle the challenges and help you foresee a flourishing bottom line [13].

Some of the features in TPCS ERP are Modular in Design, Email Alerts integrated with Bill of material modification, Raw material size to product size mapping, Material Requirement Plan with automatic indent generation, CEO's Dashboard, System Controls in material Indent, Purchase and Consumption, Authorization at Order, Indent, Purchase, Excess Receipt and Excess Issue entry points, WIP tracking with hand-held computers [14,15].

Benefits of TPCS ERP are Improve Productivity, On-time Dispatch of Orders, Reduced Production Lead time, Reduced Operating Expenses, Up-to-the-minute access to information for decision making[16,17].

METHODOLOGY

Automated ERP using TPCS contains five steps Sales order Processing, Material Planning, Purchase Department, Inventory and Production.

A. Sales Order Processing

Order processing module deals with the data received from buyers starting from the order indication which usually begins with an email or tele-communication and converting those indications into confirmed orders which would apparently be sub divided into work or factory orders to facilitate production based on the delivery dates or style. The reference number of

an internal order will be used for tracking the order until the shipment of that order. At the start of a season, buyers will give information about the orders for that season. Some of these orders may not be confirmed later. This screen can be used to maintain the details about the confirmed and non-confirmed orders. TPCS helps you to identify confirmed and not-confirmed orders by the report order indication vs. buyer order. Any changes to the order indication can be updated in this screen. For e.g. the quantity of the order indication gets changed or the color of the end product changes. All these changes are documented in this screen. Amendment screen is to maintain a history of the order indication. It will be having the same screens like order indication. Every time when an entry is made a new amendment number will be given for the order indication and the last amendment number stays active.

The confirmed orders from the buyers are called as buyer order. A buyer order is an internal document of the enterprise, meaning it is generated by the enterprise itself. A buyer order will record the buyer's originating purchase order which is an external document. All the commercial details of the order will be maintained in Buyer Order. A buyer order can be converted into an internal order for the ease of production.

The sketch number in buyer order is not mandatory. This is because the BOM for the style will be fixed after the orders come from buyer. So TPCS will allow user to put buyer orders without sketch number. Then the BOM will be documented and will be linked with product (For more details about linking BOM with product refer admin module manual).

But the sketch number is mandatory in internal order. So before documenting the internal orders the BOM should be entered and linked with product. The sketch number captured in the internal order will be automatically updated in buyer order.

Any changes to the Buyer Order can be updated in this screen. For e.g. the quantity of the buyer order gets changed or the color of the end product may change. All these changes have to be entered in this screen. Amendment screen is to maintain a history of the buyer order. It will be having the same screens like buyer order. Every time when a change is made a new amendment number is given for the buyer order and the last amendment number stays active. The same steps followed in internal order amendment. Figure 1 shows sales order processing.

Validations in Order Indication:

1. All the fields that are in bold font are mandatory fields.
2. If the order indication has been cancelled then it cannot be used in further transactions like buyer order, internal order etc.
3. You cannot edit data in a cancelled or closed order indication.
4. You can edit data in the financial year for which year-end process is not completed.

5. Date of closing and expected date of delivery should be greater than the order indication date.
6. Duplications are not allowed. You cannot enter the same, style, leather and color in a same order indication.
7. Based on the user permission, TPCS will restrict the user to enter, edit, delete and view data.
8. The discount percentage in order indication screen and wastage percentage in components screen cannot be greater than 100.
9. You can edit an order indication with the latest amendment number. For example, there are four amendments made for an order indication then TPCS will allow you to amend the 4th amendment which is the latest one. Other amendments cannot be modified.

Validations in Buyer Order:

1. All the fields that are in bold font are mandatory.
2. Same Style, leather, color and size range can't be entered twice in a buyer order. TPCS will not allow duplicate entries.
3. Auto display function works only if an Order Indication is referred for that Buyer Order.
4. The entries which you have made will be displayed in the grid and you can check your entries before saving the Internal Order.
5. If you wish to increase the quantity in a internal order which is referred in buyer order, first you have to increase the quantity in buyer order by amendment and then in internal order.
6. If you wish to decrease the quantity in buyer order which is referred in internal order, first you have to decrease the quantity in internal order and then in buyer order.
7. You cannot cancel a buyer order if it is referred in the internal order.
8. You cannot edit data in a cancelled or closed buyer order.
9. Date of closing and expected date of delivery should be greater than the buyer order date.
10. The discount percentage in buyer order screen and wastage percentage in components screen cannot be greater than 100.
11. You have to enter a valid order indication no while referring an order indication in buyer order.
12. Authorized buyer order cannot be edited.
13. If an order indication is referred in buyer order, then the buyer order date should be greater than the order indication date.

14. Duplication is not allowed in packing instruction screen. i.e.: Same Pack-Type and Size-Range cannot be entered twice.
15. The total quantity entered and the sum of quantity entered in all the sizes and styles should be equal for a buyer order.
16. You cannot alter a buyer order if it is authorized.
17. If the delivery date is entered then you cannot schedule for the already entered delivery date.
18. If the option "Tick if profit center mandatory" is selected in admin-settings, then entry for profit center is mandatory. For more details refer to admin module.
19. If internal order is entered for a buyer order then you cannot delete the buyer order.
20. You cannot enter multiple delivery date for a style having various sizes in the size-breakup.

14. If the option "Tick if profit center mandatory" is selected in admin-settings, then entry for profit center is mandatory. For more details about the profit center please refer admin module.

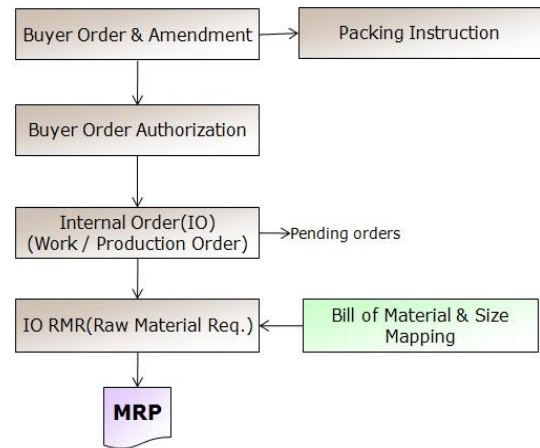


Figure 1: Sales order Processing

Validations in Internal Order

1. The fields which are in bold font are mandatory.
2. There can be only one entry for same style, color, size range and sketch no.
3. The entries which you have made will be displayed in the grid and you can check your entries before saving the Internal Order.
4. Auto display function works only if a buyer order is referred for that internal order.
5. You cannot modify the data in a cancelled order.
6. If you make any changes in the Internal Order then you have to recalculate the IORMR for that order.
7. The system won't allow you to enter duplicate entry. For e.g.: You cannot enter the same leather, color, size-range which is already entered.
8. Internal Order date cannot be lesser than the Buyer Order Date.
9. Date of closing the Internal Order cannot be earlier than Internal Order Date.
10. Expected ship date should not be less than internal order Date.
11. You can edit an internal order with the latest amendment number. i.e.: There are four amendments made for an internal order, and then TPCS will allow you to amend the 4th amendment which is the latest one.
12. If the quantity entered in internal order is greater than the quantity entered in buyer order, then TPCS will alert you about the valid quantity that can be entered for this internal order.
13. You cannot reduce the ordered quantity if issue is made for the ordered sets.

B. Material Planning

Material Requirement Planning (MRP) is a logical, easily understandable approach to the problem of determining raw materials, assemblies, sub-assemblies and parts needed to manufacture an end product.

MRP determines 'how much' of each item is needed and 'when' to produce a specified number of end products in a specified time period by evaluating the Order details, BOM and the Inventory record files.

The basic purposes of MRP system are to determine the raw materials required to manufacture an end product, to create valid schedules for obtaining the raw materials, to do capacity planning and to control the inventory to satisfy the customer at optimum cost. In short, it gets the right material to the right point at the right time. Figure 2 shows Materials Processing.

MRP in TPCS

MRP in TPCS starts with weekly plan for the Internal Orders based on their ship date, style etc that is selected and is followed by job card release. Job cards are released based on the quantity of the Internal Orders and cutting slip is generated which is considered as the initial step in the production process.

Indents and Reservations are posted automatically based on the inventory file for all the raw materials.

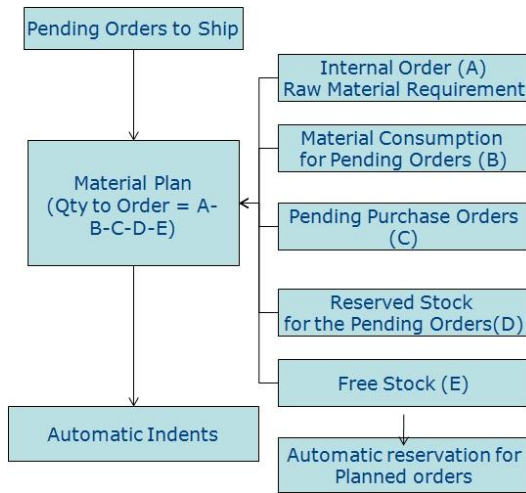


Figure 2: Materials Planning

than the order consumption unless a second level authorization is done.

Validations in Supplier selection screen

1. If an amendment request is raised for a indent, then TPCS won't allow selecting supplier for that indent. The indent should be amended for selecting supplier.
2. If there is no supplier fixed for a material then TPCS will prompt to fix a supplier, rate and lead time for that material by clicking "new supplier".
3. Suppliers can be selected for different quantities of the material. The total quantities entered for different suppliers should not exceed the indent quantity.
4. For materials having various sizes, the quantity in size- breakup and supplier quantity should be equal.
5. TPCS won't allow user to select same supplier for the same material and same indent which is already in the grid.
6. MRP Margin Percentage cannot be greater than 100.

Validations in Purchase Order

1. TPCS won't allow duplicate entries. You cannot enter twice a record having same Indent no, material and colour.
2. Purchase order for which GRN is received cannot be canceled.
3. While canceling a PO, TPCS will alert you if the remarks are not entered for it.
4. Modification is not allowed for an authorized PO.
5. The percentage for all the taxes should not exceed 100.
6. Expected date cannot be earlier than Purchase Order Date.
7. Dispatch date cannot be earlier than Arrival Date.
8. TPCS will give an alert message while raising PO quantity greater than the indent quantity.
9. If the supplier selection is not done then TPCS will alert with message before saving the purchase order.

C. Purchase Order

A purchase order (PO) is a commercial document issued by an organization to supplier indicating raw materials, quantities, payment terms, shipment details and agreed prices for products or services the buyer will provide to the organization. In TPCS, based on the delivery schedule confirmed to the buyer, material requirement is analyzed and purchase order is released to the suppliers. Expected date has to be mentioned in the PO. The tax configuration can be edited if the option "Tick if tax configuration can be edited in purchase order" is selected. Validations for Indent screen. Figure 3 shows purchase order.

1. Indents cannot be edited when supplier selection is made for it. Only amendment is possible after authorization.
2. TPCS will alert you to enter remarks, while user tries to cancel a indent. However, remarks entry is optional.
3. Indents cannot be edited if the indent amendment request is raised for it.
4. Indents cannot be deleted if supplier selection is made or purchase orders are raised for it.
5. Date of closing the Indent should not be earlier than Indent date.
6. Expected date of delivery cannot be less than the indent date.
7. TPCS won't allow duplicate entries. You cannot enter a record twice such as having same IO no, material and colour.
8. TPCS won't allow reducing the indent quantity if the supplier selection is made or purchase orders are raised for it.
9. For Stock Indents Qty entered cannot be greater than Reorder level.
10. TPCS won't allow indenting a quantity that is greater

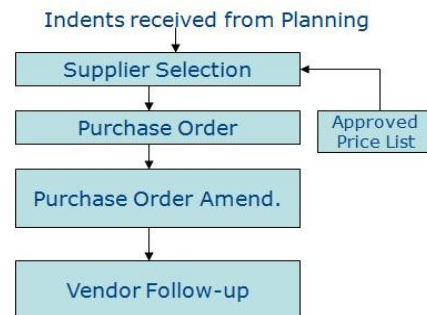


Figure 3: Purchase Order

D. Inventory

Inventory deal with stock on-hand for all raw materials and finished goods. The raw materials, work-in-process goods and completely finished goods are considered to be a portion of a business's assets. Inventory represents one of the most important assets that most businesses possess, because the turnover of inventory represents one of the primary sources of revenue generation and subsequent earnings for the company's shareholders/owners.

E. Production

The raw materials undergo various stages of production, in order to bring out the end product. The various stages in production are cutting, pre-fitting, assembly, upper charging, bottoming, packing, etc.

Production module in TPCS helps you to identify the order status of the internal orders. Stage wise production tracking for the materials can be made through the work in progress report. Figure 4 shows production.

RESULT ANALYSIS

Materials can be categorized based on their consumption value. Materials having high-consumption value comes under A-class, materials having medium-consumption value comes under B-class and materials having low-consumption value comes under C-class. Figure 5 shows ERP operational flow. The Table 1 and 2 shows the sample material, consumption values and stock values.

Example: The following are the materials and their consumption values.

Table 1: Sample Material and consumption values.

Material	Consumption value
C	42000
D	38000
H	22000
F	30000
G	26000
B	46000
E	34000
J	14000
N	12000
I	18000
K	13500
L	13000
M	12500
A	50000

The ABC analysis is made using the following calculation.

70 % of the consumption value comes under category 'A'.

20 % of the consumption value comes under category 'B'.

10 % of the consumption value comes under category 'C'.

The materials in the above are arranged in descending order based on their consumption value. Cumulative percentage is calculated for each material.

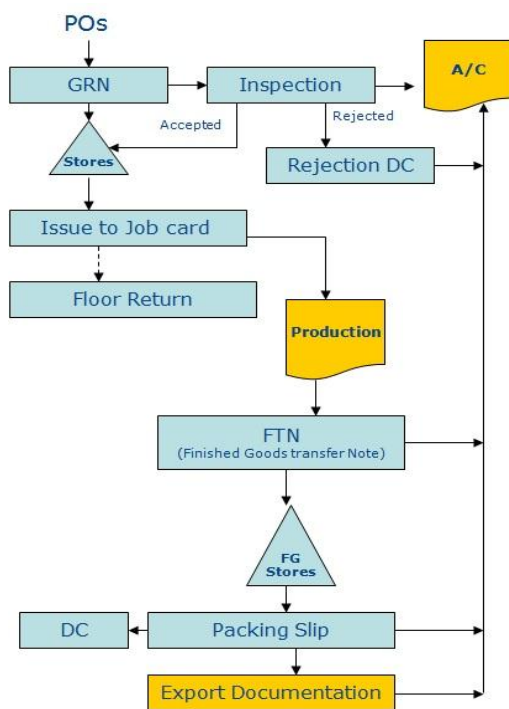


Figure 4: Production

Validations in this screen

1. Entry in this screen will be reflected in class ABC in item master. The category of the materials will be updated.

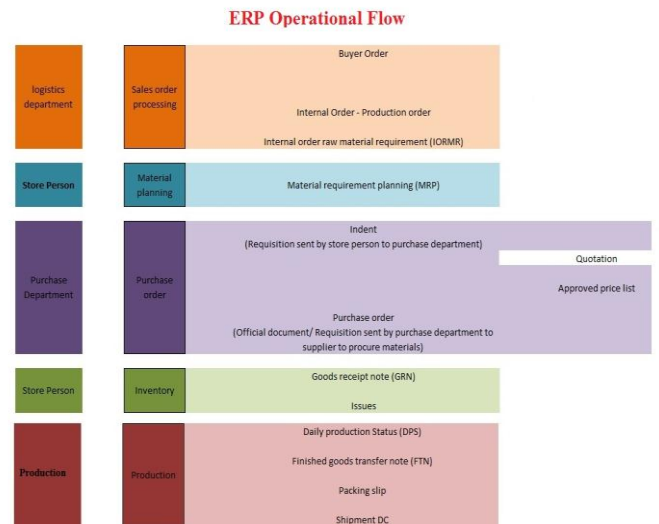


Figure 5: ERP Operational flow

XYZ Analysis

In XYZ analysis materials are categorized based on their stock value. Materials having high-stock value come under X-class, materials having medium-stock value come under Y-class and materials having low-stock value come under Z-class.

Example: The following are the materials and their stock values.

Table 2: Sample material and their stock values

Material	Stock Value
C	Rs.42000
D	Rs.38000
H	Rs.22000
F	Rs.30000
G	Rs.26000
B	Rs.46000
E	Rs.34000
J	Rs.14000
N	Rs.12000
I	Rs.18000
K	Rs.13500
L	Rs.13000
M	Rs.12500
A	Rs.50000

The XYZ analysis is made using the following calculation.

Let us take that,

70 % of the stock value comes under category 'X'.

20 % of the stock value comes under category 'Y'.

10 % of the stock value comes under category 'Z'.

The materials in the above are arranged in descending order based on their stock value. Cumulative percentage is calculated for each material.

Validations in this screen

Entry in this screen will be reflected in class XYZ in item master. The category of the materials will be updated.

CONCLUSION

ERP is the future of many type of industries like Footwear, Garments, Leather Products, etc. ERP systems provide a mechanism for implementing systems where a high degree of integration between applications is required. The Business Case or Value Proposition for implementation must be outlined. To successfully implement a proper mix of people, processes and technology should be maintained. In Future ERP can be used in latest platforms and different databases.

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