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Libero Workshop

Manufacturing Management

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OVERVIEW

Knowing the big interest of the community in setting up and executing the Manufacturing process in ADempiere, I created this Blog to explain the way how to setup and operate the manufacturing functionality.

Business Case Chemical Industry (Process Production):

The Management of Garden World evaluated the possibility of getting a profits increase by manufacturing the fertilizer and took decision to open a new manufacturing plant to produce the fertilizer which before Garden World only purchased and sold.

So the engineering department designs two bills of materials to produce the Fertilizer in 50 and 70 kg packages and also a formula used for gross production of the fertilizer.

The Lawn Fertilizer uses following raw materials:

| | |
|------------|-----|
| Phosphorus | 17% |
| Nitrogen | 17% |
| Potassium | 17% |
| Water | 49% |



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**Business Case Furniture
Industry (Discrete
production):**

On the other side, the Management of Garden World evaluated the possibility of increasing profits by manufacturing the Patio Set and took the decision to open a new manufacturing plant to make the Patio Set which before Garden World only purchased and sold.

So the engineering department designed two bill of materials to produce the Patio Set and Chair.

Patio Set uses following raw materials and sub-assemblies:

Bill of Material Patio Set Furniture

Patio Table 1 Piece
Patio Chair 4 Pieces
Sun Screen 1 Pieces

Sub-assembly

Bill of Material Chair Furniture

Seat 1 Piece
Back Support 1 Piece
Back Leg Assembly 1 Phantom
Front Leg Assembly 1 Phantom

Bill of Material Back Leg

Back Leg 2 Pieces
Screw 8 Pieces
Ultra Glue 5 ml

Bill of Material Front Leg

Front Leg 2 Pieces
Screw 8 Pieces
Ultra Glue 6 ml



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Engineering Management

We now build this BOM and formula into ADempiere.

In the option Manufacturing Management → Engineering Management → Bill of Material & Formula
we define the BOM and Formula.

How we define a BOM & Formula:

The BOM is defined based on Quantity, whereas formulas are defined based on %. The other important points we can define are scrap, issue method and component type.

Component Type we can define the following ways:

- Component: used to define the normal usage
- Option: used for product configuration. Defines different mandatory alternatives where quantities of components for the option are specific, e.g. (Laptop Screen 15" or 17")
- Variant : used for product configuration. Defines the component, but the user decides end product's quantities. e.g. (PC with one , more or none backup batteries)
- Phantom: Defined when we need a logical subassembly in the manufacturing process, but this never is stocked, so when a the material plan is calculated, a supply is not generated to cover this products and phantom product's components are exploded in the same manufacturing order.
- Packing : Defines the components that are used for packing the finish good e.g. (Cardboard boxes , Bag ,etc) and is use to get the packing list report.

Note: for this component type the component is not multiplied for BOM quantity e.g. (one cardboard box for one order).

•Scrap: Used to define the waste in the manufacturing process, but necessary for planning.
Note: for this component type the component is not multiplied for BOM quantity e.g. (one card box for one order).

- Planning: will be used for Planning BOM functionality. Not implemented yet
- Tools: Defines the components that are used as tools for manufacturing product like Patterns and Quality measurement instruments.

Note: for this component type the component is not multiplied for BOM quantity e.g. (patterns to inject the plastic in work center).



Resource Manufacturing;

Resource Manufacturing; Defines the work centers that will be used to produce any product in the manufacturing workflow.

Manufacturing Workflow Fertilizer Packing for Fertilizer#50 and #70:

| Activity | Resource | Setup Time | Duration | Waiting Time |
|-----------------|-------------------------|------------|----------|--------------|
| Packing Process | Packing Production Line | 0 | 3 | 1 |

Manufacturing Workflow for Lawn Fertilizer:

| Activity | Resource | Setup Time | Duration | Waiting Time |
|----------------------|----------------------------|------------|------------|--------------|
| Mixed | Mixed area | 15 minutes | 30 minutes | |
| Inspection the Mixed | Fertilizer Inspection Area | 0 | 10 minutes | |

Manufacturing Workflow for Patio Set

| Activity | Resource | Setup Time | Duration | Waiting Time |
|------------------|----------|------------|------------|--------------|
| Assembly Process | Assembly | 0 | 20 minutes | |

Manufacturing Workflow for Chair Furniture:

| Activity | Resource | Setup Time | Duration | Waiting Time |
|-------------------------|----------------------------|------------|------------|--------------|
| Assembly | Mixed area | 15 minutes | 30 minutes | |
| Paint | Fertilizer Inspection Area | 0 | 10 minutes | |
| Drying | Drying | | | 60 |
| Chrome Subcontract Area | Chrome Subcontract Area | | | 24 |
| Inspection Process | Inspection Area | | 10 | |



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Independence Demand

Fertilizer Plant

The Fertilizer Plant implements a chemical process that manufactures the Lawn Fertilizer in two different packings of 50 and 70 kg.

Furniture Plant

To now create the Independence Demand based on Sales Order we to do the following :

1. In the option Quote-To-Invoice → Sales Orders → Sales Order window create a new Document with following values.

- Organization: Fertilizer
- Document Type : Standard Order
- Date Promised: 07/01/2009
- Business Partner: Seed Farm
- Delivery Rule : Available
- 1. Create a new Sales Order line with next values:
 - Product: Fertilizer#70
 - Quantity: 70
 - Price : 33
 - Tax : Standard

1. In the option Quote-To-Invoice → Sales Orders → Sales Order window create a new Document with following values.

- Organization: Fertilizer
- Document Type : Standard Order
- Business Partner: Seed Farm
- Date Promised: 07/01/2009
- Delivery Rule : Available
- 1. Create a new Sales Order line with next values:
 - Product: Fertilizer#50
 - Quantity: 60
 - Price : 20
 - Tax : Standard

Forecast Management

To create Independence Demand based in Forecast we to do the following:

In the option Manufacturing Management → Planning Management → Forecast Management → Forecast window create a new record with following values:

- Organization: Fertilizer
- Name: Forecast for July 2009
- Price List: Standard
- Calendar : Garden World Calendar
- Year: 2009

1.Create the next forecast line:

| Sales Representative | Warehouse | Product | Quantity | Date Promised |
|----------------------|------------|---------------|----------|---------------|
| SuperUser | Fertilizer | Fertilizer#70 | 10 | 07.03.09 |
| GardenAdmin | Fertilizer | Fertilizer#50 | 22 | 07.03.09 |
| SuperUser | Fertilizer | Fertilizer#70 | 11 | 07.10.09 |
| GardenAdmin | Fertilizer | Fertilizer#50 | 21 | 07.10.09 |
| SuperUser | Fertilizer | Fertilizer#70 | 11 | 07/17/09 |
| GardenAdmin | Fertilizer | Fertilizer#50 | 21 | 07/17/09 |
| SuperUser | Fertilizer | Fertilizer#70 | 11 | 07/24/09 |
| GardenAdmin | Fertilizer | Fertilizer#50 | 20 | 07/24/09 |
| SuperUser | Fertilizer | Fertilizer#70 | 10 | 07/31/09 |
| GardenAdmin | Fertilizer | Fertilizer#50 | 20 | 07/31/09 |

In Manufacturing Management → Planning Management → Forecast Management → Forecast Report we can see the Forecast report by Sales Representative and total value of forecast.



Planning Management

In the Manufacturing Management → Planning Management → MRP → MRP Info we can review the information with following parameters:

- Independence Demand
- Product: Fertilizer#70
- Warehouse: Fertilizer
- Product: Fertilizer#50
- Warehouse: Fertilizer
- Dependence Demand
- Product: Fertilizer
- Warehouse: Fertilizer
- Potassium
- Warehouse: Fertilizer

In this view you can look both demand as gross requirement and an On Hand project quantity that indicates the availability of material in the future. If this is negative then is necessary to generate a supply.

2.In Manufacturing Management → Planning Management → Product Planning Data window we need to review the following information:

Select the Product Fertilizer#50 and go the Data Planing Tab we should to have the following information:

- Organization: Fertilizer
- Product: Fertilizer#50
- Resource: Fertilizer Plant
- Warehouse: Fertilizer
- Planner: GardenAdmin
- BOM & Formula: Fertilizer#50
- Workflow: Fertilizer Packing Process
- Is MPS: Yes
- Create Plan : Yes
- Promised Delivery Time: 1 Day
- Order Policy: Period Order Quantity
- Order Period: 5
- Minimum Order Qty:_10
- Yield%: 100

Select the Product Fertilizer#70 and go the Data Planing Tab we should to have following information:

- Organization: Fertilizer
- Product: Fertilizer#70
- Resource: Fertilizer Plant
- Warehouse: Fertilizer
- Planner: GardenAdmin
- BOM & Formula: Fertilizer#70
- Workflow: Fertilizer Packing Process
- Is MPS: Yes
- Create Plan : Yes
- Promised Delivery Time: 1 Day
- Time Fence: 7 Days
- Order Policy: Period Order Quantity
- Order Period: 5
- Minimum Order Qty: 100
- Yield%: 100



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Planning Management

In Manufacturing Management → Planning Management → MRP → MRP Info we can review the information with following parameters:

- Independence Demand
- Product: Fertilizer#70
- Warehouse: Fertilizer
- Product: Fertilizer#50
- Warehouse: Fertilizer
- Dependence Demand
- Product: Fertilizer
- Warehouse: Fertilizer
- Potassium
- Warehouse: Fertilizer

In this view you can look both demand as gross requirement and an On Hand project quantity that indicates the availability of material in the future. If this is negative then is necessary to generate a supply.

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Select the Product Fertilizer#50 and go the Data Planing Tab we should to have the following information.

Organization: Fertilizer

- Product: Fertilizer#50
- Resource: Fertilizer Plant
- Warehouse: Fertilizer
- Planner: GardenAdmin
- BOM & Formula: Fertilizer#50
- Workflow: Fertilizer Packing Process
- Is MPS: Yes
- Create Plan : Yes
- Promised Delivery Time: 1 Day
- Order Policy: Period Order Quantity
- Order Period: 5
- Minimum Order Qty:_10
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Select the Product Fertilizer#70 and go to the Data Planing Tab where we should to have following information:

- Organization: Fertilizer
- Product: Fertilizer#70
- Resource: Fertilizer Plant
- Warehouse: Fertilizer
- Planner: GardenAdmin
- BOM & Formula: Fertilizer#70
- Workflow: Fertilizer Packing Process
- Is MPS: Yes
- Create Plan : Yes
- Promised Delivery Time: 1 Day
- Time Fence: 7 Days
- Order Policy: Period Order Quantity
- Order Period: 5
- Minimum Order Qty: 100
- Yield%: 100

Now that we have the independent Demand and Planning data we need to calculate the Material Plan to get the supply orders.



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MRP

In the option Manufacturing Management → Planning Management → MRP → Calculate Material Plant with next parameters:

- Organization: Fertilizer
- Resource: Fertilizer Plant
- Warehouse: Fertilizer Plant

When this process ends it shows that Manufacturing Orders or Material Requisitions and Notice Messages that were generated.

Repeating MRP Info we can see how MRP generated the Planned Orders and material requisitions.

In the option Manufacturing Management → Production Management → Discrete Manufacturing → Manufacturing Order Review

we can review our Master Production Schedule.

In the option Manufacturing Management → Planning Management → MRP → Planned Order Approval

we can accept and confirm the suggestion generated for calculating material plan.

This process changes the Manufacturing Order's document status from Draft to In Process. Indicating that this Orders were confirmed. The Manufacturing Order with Document Status In process are not created again when a new calculation material is executed.

In the option Manufacturing Management → Production Management → Discrete Manufacturing → Component Check

we can review if a Manufacturing order can be completed (release to production shop). This report shows the material requirement vs availability in inventory. So if the material is available then the Manufacturing Order can be released to production shop



Production Management

In the option Manufacturing Management → Production Management → Discrete Manufacturing → Print & Release Order

we can get the Pick List , Pack & Tools List and workflow manufacturing as a preliminary, and if the information is right we can mark the complete check box to try to release order.

Note: This option validates that the material to Manufacturing Order is available to can release the order.

In the option Manufacturing Management → Production Management → Discrete Manufacturing → Order Receipt and Issue, we can receive the finished goods and components delivery to production shop. Here we can use multiple options to report the production:

- Delivery Rule :
 - Back flush : Allow receipt and component delivery based on the quantity to deliver
 - Only Issue : Allow only components delivery to production shop
 - Only receipt: Allow only receive of finished goods.
 - In this case we will use Back flush for Manufacturing Order that has been released with following information:
- Qty to Deliver : Which quantity you need to report
- Qty Scrap : Which quantity you need to report
- Movement Date: Which Date to Report
- Locator: The Locator where we receive the materials.

In the option Manufacturing Management → Production Management → Activity control we can report the actual events that happen in the production shop, To report the actual setup time and duration created a new record with following information:

The Manufacturing Order that you want to report choose the Manufacturing Order Activity that you need to report typed in the actual setup ,duration time and movement quantity.

Note : The Activity Control report allows to register actual events that happened in the production shop and get the actual cost.



CRP

Until now we saw material transactions, but what about resource capacity?

Analog to materials we need to know the availability capacity for manufacturing resources.

To review the resources' capacity we execute first the MRP, which allows us to get schedules starting and finishing dates, calculated by the MRP process.

We then create the Capacity Plant:

In the option Manufacturing Management → Planning Management → CRP

We can calculate the Capacity Plan the following way:

- Select the option backward and forward as applies:
- Backward: the CRP (Capacity resource planning) calculates the scheduled starting and finishing dates based on the order's promised date.
- Forward: the CRP calculates the scheduled finishing date based on the order's scheduled starting date.

After we have calculated the capacity plan, we can review the load vs. capacity for each resource two ways:

In the option Manufacturing Management → Planning Management → CRP → Resource load view with following parameters:

- Select the manufacturing resource and date from to review the load vs the capacity in a general way.

In the option Manufacturing Management → Planning Management → CRP → CRP info with following parameters:

- Select the manufacturing resource as well as from and to dates. This shows the load vs capacity and the detailed manufacturing order's activities.



Standard Costing Management

We do know planning of materials and resource capacities, but what happened to manufacturing costs ?

The Standard Cost Functionality is based on the Cost Absorption
To define the resources rate for Labor and Burden rate:

| Resources | Labor Rate | Burden Rate |
|-------------------------|------------|-------------|
| Assembly Area | 2 USD | 0.02 USD |
| Chrome Subcontract Area | 0 USD | 0 USD |
| Dry Area | 1 USD | 0.01 USD |
| Inspection Area | 3 USD | 0.03 USD |

In the option Performance Analysis → Product Cost

Select the product, goto Product Costs and set the labor and burden rate based on the cost element..

Now we can calculate the labor and burden cost for each manufacturing node.

In the option Manufacturing Management → Standard Costing Management → Workflow Cost Roll-Up with following parameter :

- Organization: Furniture
- Account Schema: GardenWorld US/A/US Dollar
- Cost Type: Default
- Costing Method: Standard Costing

Once we have calculated the Labor and Burden it is necessary to integrate all the manufacturing costs (Material, Labor, Burden , Outside Processing, Overhead)

In the option Manufacturing Management → Standard Costing Management → Bill of Material & Formula Cost Roll-Up with following parameter :

- Organization: Furniture
- Account Schema: GardenWorld US/A/US Dollar
- Cost Type: Default
- Costing Method: Standard Costing

Now we can review the result cost integration all levels

In the option Manufacturing Management → Standard Costing Management → Cost BOM Multi Level Review

In this report we can look the cost integration for all cost element and levels.

What is the Cost This Level & Cost Lower Level?

Cost This Level indicates all related costs with the parent product for its immediate level. Usually only the Labor and Burden.

The Cost Lower Level indicates the summary of components' cost for all cost elements.

In the option Performance Analysis → Costing → Product Cost

We can review results like which cost was calculated.

Manufacturing Management → Standard Costing Management → Cost Collector is the place where all the production transactions are saved and the accounting costs are posted. It allows to register the cost without needing to close the Manufacturing Order.



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