Microsoft Dynamics AX

Implement Best Practices, Gain Insight, and Promote Efficiency with Process Industries for Microsoft Dynamics AX

White Paper

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Introduction

Today's process manufacturers face enormous pressures. In order to remain competitive, these businesses need to convert raw materials efficiently and cost-effectively into final products, while addressing a broad range of regulatory and customer requirements. They must also keep their operating costs low while controlling the variability of raw materials at each stage of production. Regulations may change, trading partners and suppliers may be replaced, and raw material quality may improve or degrade, all of which potentially dictate adjustments in formulas or recipes.

Process manufacturers require a software solution that combines the planning and reporting capabilities of a traditional business management system with the unique tracking, control, and multi-dimensional inventory requirements of process manufacturing. By using these capabilities, they can integrate the entire process manufacturing lifecycle and increase the flow of information internally and with customers and trading partners. As a result, process manufacturers can better manage all the variables required to make and deliver high-quality products to custom specifications, gain visibility into production and supply chain activities, optimize capacity, comply with regulatory requirements, and drive continuous process improvement.

Designed specifically for the process manufacturer, Process Industries for Microsoft Dynamics® AX can help companies increase the speed and efficiency of their manufacturing operations, communicate more effectively with their extended supply chain, and access real-time information to gain deeper insight into their businesses.

This white paper describes the unique requirements of process manufacturers and discusses how Process Industries for Microsoft Dynamics AX can address those needs. It includes an overview of Process Industries for Microsoft Dynamics AX and a summary of key functions and concepts.

Process manufacturing encompasses a wide range of operations. For example, chemical companies often use formulas, while most food and beverage manufacturers use recipes. Likewise, manufacturers in different process industry segments configure products for customers differently. Food, chemical, and pharmaceutical companies tend to use containers and packaging, while basic metals and pulp and paper companies often use variations of end items. For the purposes of this paper, the terms “formula management” and “recipe management” are synonymous.

While certain process manufacturing segments have unique characteristics, the underlying management and planning techniques used in all segments are similar. A single software solution can address the collective set of business requirements. The differences, however, between process and discrete manufacturers are fundamental and cannot be addressed well with a single software solution.

Recipe or Formula Management

Discrete products are assembled from a fixed quantity of components included in a bill of material and produced in a relatively linear, predictable manner. Process industry products, in contrast, result from a series of mixing operations, chemical reactions, extractions, disassembly, or other actions that transform raw materials into final, sellable products. Recipes generally include more variations than the typical discrete bill of material. Recipes link raw material consumption to operations, so the same ingredient could be used in multiple operations on the same batch. In discrete enterprise resource planning (ERP)
Systems, most materials are issued to the first operation, which can be a disadvantage in many process environments.

Yield management is extremely important in many recipes. Variations in intermediate results and material flow are much greater in process than in discrete manufacturing. Some raw materials, or intermediates, used in a recipe may be lost through evaporation, spillage, and the like. Process industry manufacturing personnel often must make adjustments in quantities, ingredients, and production steps as the result of unanticipated outcomes. In many companies, managing actual production variances is considered an art. In process manufacturing, it is frequently the most important step to ensuring manufacturing efficiency and profitability.

Process Industries for Microsoft Dynamics AX helps process manufacturers manage recipes and monitor variations in those recipes throughout the production process. With this solution, a user can track multiple variations of a recipe and maintain and employ alternate recipe attributes, such as whether ingredients are defined as a percentage of the recipe size or as a fixed quantity. The goal is to measure the reality of standards, measure and analyze loss at work centers, evaluate the performance of raw materials, and continually improve processes.

In process manufacturing, a recipe typically has three versions:

- **Standard Recipe**: The standard (master) recipe defines the basic formula or listing of ingredients for an item and includes raw materials, quantity, or volume of those ingredients; the routing the product follows through the plant; and the standard or anticipated costs of production. In a recipe, raw materials can be tied to operations in the routing. Most manufacturers freeze the standard recipe for some period of time, such as a year, a quarter, or a month. In life sciences, recipes need to be locked so only the master recipe can be issued to production.

- **Adjusted Recipe as Planned**: When production is planned using the exploded recipe, the production manager can make on-the-fly adjustments to the recipe, such as increasing the amount of raw materials required, changing the raw material itself, or selecting alternate routings. Generally such changes are made because the production manager has evaluated the production environment, the condition of on-hand materials and equipment, and other information not available through the system, and determined which variations must be made to achieve the desired result. For example, a manager may decide to increase the amount of flour in a recipe for a batch of bread or decrease the speed of the line through the oven, because of the relative humidity of the plant. At this point the production order has not been released to the floor. These one-time changes are made to process and recipe details included in the production order itself.

- **Adjusted Recipe as Produced**: The adjusted recipe as produced describes the actual combination of ingredients used in production. It differs from the standard recipe and bill of material, and from the adjusted recipe as planned, in that it takes into account any additional unplanned events that may have occurred such as:
  - Using non-standard amounts of raw materials.
  - Completing more product than planned (due to a better-than-expected yield or a larger-than-needed shrinkage factor).
- Consuming more or less time at a work center or in the overall schedule than anticipated.
- Obtaining unexpected co-products and/or by-products that, in turn, can be considered raw materials or finished goods.
- Changes in production factors such as degrading machine tolerances or environmental changes.

For example, when a production manager adjusts the amount of flour in a bread recipe at the time the order was planned and released, the humidity may change again when the operator actually mixes the dough, in which case a different amount of flour must be used. With Process Industries for Microsoft Dynamics AX, the adjusted formula as planned and the adjusted formula as produced (the actual formula) can be tracked and employed as needed when conditions require variations.

**Raw Materials Management**

Process Industries for Microsoft Dynamics AX provides a flexible approach to handling raw materials that includes:

- Managing and tracking co-products and by-products, recycles, and re-blend/ rework.
- Analyzing the distributed costs associated with co-products and by-products.
- Using first expired/first out (FEFO) logic to reserve specific lots of materials.
- Managing multiple containers and packaging variations of a main item, including two-level recipes and catch weights for package variations from a single main item.

**Co-Products and By-Products**

As every process manufacturer knows, production processes can yield materials other than the planned end item. These additional outputs, called co-products or by-products, may be reused, sold at a profit, or disposed of at a cost. Co-products and by-products are symptoms of the volatility that can occur while manufacturing process items. Generally, co-products are desirable secondary outputs from the manufacture of the planned product that can be sold or reused profitably. By-products are unavoidable secondary outputs that may be sellable or usable, or they may be waste that must be disposed of at a cost. Occasionally by-products can be sold for a profit, but this is the exception rather than the rule.

Manufacturers can efficiently manage, track, and account for the costs of multiple outputs from a single production run, as illustrated in Figure 1.
IMPLEMENT BEST PRACTICES, GAIN INSIGHT, AND PROMOTE EFFICIENCY WITH PROCESS INDUSTRIES FOR MICROSOFT DYNAMICS AX

Figure 1. Plan and manage multiple co-products and by-products resulting from the same item or process.

Costing for Co-Products and By-Products

While each process manufacturing company handles the costing of co-products and by-products in a slightly different way, Process Industries for Microsoft Dynamics AX supports three industry standards for best practices:

- No cost
- A manual, hard-allocated cost
- A pro rata cost based on a percentage of the weight of the total recipe

Costing for co-products and by-products can be determined by the percentage of the total cost of the recipe allocated to them. If a by-product results in a material that can be used or sold, the cost allocation is positive. However, if the manufacturer has to pay to dispose of the by-product, the cost allocation is negative. For example, the main item might cost 10 percent more to produce because of the cost of disposing of a by-product. As a result, the main item carries 110 percent of the cost. A negative value would be applied as a burdened cost on the remainder of the items in the recipe, based upon percentage.

Co-products always result in a positive cost allocation. Consequently, a co-product can assume part of the recipe costs. For example, if a co-product weighs 10 percent of the total production output, then the main item costs 10 percent less, or carries only 90 percent of the cost. To make this allocation, a user must select a pro rata cost allocation option instead of the no-cost option when creating the recipe for the product.

A recurrent (recycle) co-product or by-product is both a raw material in the formula and a result of production. For example, if 10 percent of a raw material does not dissolve when it is mixed with other ingredients, this quantity can be recovered at a later stage in production and received back into inventory as a co-product to be reused in a subsequent production run.
With Process Industries for Microsoft Dynamics AX, manufacturers can easily track and analyze co-product and by-product attributes and costs using the cost system that works best for them, and credit the value of these items to the appropriate finished goods.

**Multiple Containers, Packaging, and Variations of a Main Item**

Process manufacturers generally handle packaging in one of three ways:

- **As end items of a main item:** In most cases, an end item is a main item that is produced and stored in multiple containers or variations.
- **As separate stockkeeping units (SKUs) packaged with a specified unit amount:** End item functionality manages the situation where each case or container has a different actual weight compared with its theoretical or standard weight.
- **Stored as bulk, sold as bulk, and kept in bulk containers or totes.**

Manufacturers can use enhanced configuration capabilities to capture multiple variations for a main item without creating unique item codes and recipes. For example, it is now possible to track end items in different containers (such as 10-lb. versus 20-lb.), different packaging types (such as private label packaging), or simply as variations of the main item (such as various widths). When an item is defined in this way, manufacturers can view the total inventory balance by the base unit of measure (UOM) and the breakdown by container type at the same time, on the same screen.

This detailed product view enables a salesperson to accurately assess inventory levels and quickly suggest a similar product when the exact type requested by the customer is not available. Planning at the SKU level will expand through the formulations for bulk production planning, as well as corresponding ingredient, raw materials, and packaging requirements.

**Catch Weight**

In process manufacturing, products are often tracked by actual weight throughout the entire supply chain. For example, in the meat industry, a weigh-in after each set of cuts enables the manufacturers to track efficiencies by yield. Because the weight of an item can change as it goes through production, and the exact weight for packaged products can vary from the standard or anticipated weight, manufacturers require a system that enables them to track actual weight or “catch” weight throughout the entire supply chain process. This is particularly critical for those process manufacturers who commit to orders, cost, receive, produce, place orders, price, ship, and invoice products by actual weight.

Catch weight differs from dual units of measure in that it allows for the capture of an actual weight at the item level. Typically, one will work with base units and average weights, but record actual weights at the lot level. Dual units of measure offer only fixed conversions, so one 55-gallon drum must always be 55 gallons regardless of how full it is. Still, the actual weight of each case must be recorded accurately to evaluate pricing, generate invoicing, determine inventory valuation, and produce reporting.

When using Process Industries for Microsoft Dynamics AX, the warehouse staff scans or enters the actual weight of each case, skid, or batch when the inventory is picked, packed, and shipped. The total actual weight—the catch weight—is updated for the order, and the customer is invoiced for the actual quantity.
shipped. The solution also maintains an additional unit identifying the pack quantity for catch weight items, which permits more accurate finished goods management and enables manufacturers to cost and sell by container/variation combination for each main item. It is common to implement barcodes in this high transaction volume environment.

**Two-Level Recipes**
Manufacturers can employ an unlimited number of inputs and outputs in the recipe system, which is ideal when using two-level recipes—that is, recipes that can be produced and stored in multiple variations. After a user defines a two-level recipe, the solution automatically populates the list of raw materials required for the recipe when a particular packaging configuration is selected.

**Item and Customer Specifications**
Because Process Industries for Microsoft Dynamics AX supports formulas as well as a traditional bill of material, it includes several features process manufacturers require to cost and price raw materials and products correctly. In addition to the co-product and by-product cost analysis features discussed earlier in this paper, the solution also takes into account the cost of raw materials or commodities.

**Commodity Pricing**
Commodities-based businesses can work from a daily price register, such as Urner Barry, or directly from a trade exchange. Commodity pricing is an extension of commodity costing in Microsoft Dynamics AX, and can be managed through the order management functionality. This enables manufacturers to quickly adjust item and customer pricing in relation to changes in commodity prices.

If a company is selling a copper-based product such as wire, the copper content of the wire spool will change day to day as the market price of copper fluctuates. Now, the user can download the daily commodity price into the price matrix as the starting price, and then apply the price waterfall components as needed.

**Lot Management**
Many process manufacturers need extensive lot management capabilities. For example, process manufacturers must be able to track materials:

- From a specific supplier.
- As intermediate and finished goods.
- When created during production.
- As sold to specific customers.
- At the sub-lot level in catch weight environments.
- For quality control specifications and test results tied to the item/lot combination.
- For track and trace.

Lot management functionality in Process Industries for Microsoft Dynamics AX goes well beyond simple lot tracking. The solution gives manufacturers visibility into individual lots, lot status, lot quality control (QC) data, and item potency, and robust lot picking options help them to distribute inventory in optimal sequence and eliminate waste due to expiry loss. FEFO logic is included, as well as same lot batch
In the latest release, the user can now search inventory and reserve lots based on lot batch attributes.

Production Date Tracking
For accurate reporting and tracking, Process Industries for Microsoft Dynamics AX captures the production date and the lot number of raw materials received from a specific vendor. The system then calculates the shelf life of the given lot using the production date of each raw material or finished good. Process Industries for Microsoft Dynamics AX can also manage the shelf advice date (for example, “best before” date), and the retest date for every lot of a particular product. (Often a product must be retested on a regular basis to ensure the quality of the product is still acceptable.)
Manufacturers can then pull inventory in optimal sequence employing either first in/first out (FIFO) or FEFO rules to determine which lot to pick. Most ERP systems use the more common FIFO lot policy, which does not work for raw materials because the calculated shelf life date would be incorrect.

**Batch Attributes and Lot Picking Options**

In some process industries such as chemical manufacturing, items must be tested for well-defined quality specifications such as pH or potency. It is not uncommon for different lots of the same product to have different quality specifications. Although most manufacturers provide their customers with specifications for standard products, some customers order products with more precise or tighter specifications that differ slightly from the baseline quality standard.

To deliver to a customer’s specifications, the manufacturer either must produce a special lot that meets the customer’s request exactly or find a lot already in inventory that meets those requirements. If a lot meeting the customer’s needs is already in inventory, locating and pulling it to fulfill the customer order is always quicker and more cost-effective than producing a special lot.

Manufacturers can maintain exact lot location information and accurate quality specifications by lot, so it’s easy to quickly determine if a lot meeting the customer’s requested specifications is in stock or whether one must be planned and produced.

A user can even specify for each customer whether the material or product may come from any lot, must come from a full lot, or must come from the same lot that was shipped to the customer on the last order. Process Industries for Microsoft Dynamics AX then selects only those lots that meet or exceed a customer’s requirements.

**Shelf Life Management**

Process manufacturers typically employ "best before" dates or FEFO or FIFO policies to manage the shelf life and the selection of products for sale, or ingredients for production. Policies can be item-specific or warehouse-specific.

In the non-durable consumer goods sector, it is common for buyers to specify the number of shelf life days required at a ship-to location. With Process Industries for Microsoft Dynamics AX, the order management team can ship those lots that will arrive at a customer site with the correct shelf life. In many cases, this is a key component of order management or key performance indicators (KPIs) for the industry.

In addition, manufacturers can choose a picking option and link that option to the quality control (QC) system for each product. By using this capability, manufacturers can quickly identify those lots that have been tested and those requiring retesting because they have been on the inventory floor too long. Managing material shelf life helps ensure that products used or shipped still conform to specifications and have not changed or degraded over time from exposure to air, moisture, or other environmental factors.
Lot Disposition and Status with Quarantine Management

With Process Industries for Microsoft Dynamics AX, a user can specify one of two main inventory dispositions—available or unavailable—for a given lot, and then define multiple statuses per disposition. In essence, this determines whether the product in that location is netable or non-netable. Disposition codes are logical statuses of materials, whereas quarantine zones are typically physical locations. Process Industries for Microsoft Dynamics AX supports both.

A product is considered unavailable when the lot has been moved to a quarantine area or designated as quarantined. (Users can also define multiple quarantine areas within a warehouse, such as a separate testing area or a damaged goods location.) After a lot has been quarantined and flagged as unavailable, the user can record multiple reasons why the particular lot was quarantined.

Reasons include:
- QC hold
- QC failed
- Returned
- Damaged

Tracking lot status provides manufacturers with information about why a product is unavailable and supports correct disposition decisions based on whether the lot is simply waiting for testing completion or has been tested and failed.

Multi-Dimensional Inventory Views

Manufacturers can also define and monitor their inventory in various dimensions, including dual units of measure, catch-weight calculations, packaging codes, variations to the main item, and lots. While systems intended to manage discrete manufacturing data provide one or two inventory categories, Process Industries for Microsoft Dynamics AX can capture and track up to five. These dimensions enable users to group items into a number of categories based on specific attributes. By assigning multiple identification criteria or descriptive data to a given item, and by making specific inventory data easier to track, find, and manage, manufacturers can improve production and significantly enhance customer service.

Promotion Management

Many process manufacturers, especially those in non-durable consumer packaged goods and commodity industries, use rebates and trade spending programs to promote their products.

Rebates and Trade Merchandise Spending

Process Industries for Microsoft Dynamics AX provides users with effective tools to monitor and manage promotional programs, including calculating rebates in the same way it calculates sales commissions. However, the system credits the amount to the customer rather than to the salesperson. In most cases rebates are cash payments or discounts taken against a customer’s invoice. However, trade merchandise spending programs usually involve an amount of money accrued by a customer to be spent on events and promotional items.
Rebates are typically defined by a customer code and item code, and can be calculated in several ways:

- Amount per kilo or pound
- Amount per case
- Percent of sale

Rebates are calculated at invoicing, posted to the general ledger, and accrued. Rebate amounts are not shown on the customer invoice, but the rebate can be paid to the customer in the form of an account credit or a cash payment. Calculation methods include:

- Rebates by customer by product
- Rebates by customer group by product
- Rebates by customer by product group
- Rebates by groups of customers by groups of products

**Trade and Merchandise Allowances**

In addition to rebates, Process Industries for Microsoft Dynamics AX also supports trade and merchandise allowances (TMAs). Trade and merchandise allowances are defined in the same way as rebates, but TMA amounts are posted to general ledger accounts. As shown in the following table, TMA amounts are typically defined by product category and may vary by customer or customer chain.

<table>
<thead>
<tr>
<th>Chain</th>
<th>Product A</th>
<th>Product B</th>
<th>Product C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Store A</td>
<td>3.0%</td>
<td>3.0%</td>
<td>2.0%</td>
</tr>
<tr>
<td>Chain C</td>
<td>2.5%</td>
<td>3.0%</td>
<td>1.0%</td>
</tr>
</tbody>
</table>

Customers usually spend TMAs on promotional items offered by the manufacturer. With Process Industries for Microsoft Dynamics AX, multiple rebates or TMA programs can be defined and applied to a single order. However, the system calculates and applies all rebates and TMA amounts individually.
Defining Data for Rebates and TMA Programs
A manufacturer can specify several kinds of data related to a rebate or TMA, including:
- Rebate type or trade merchandising allowance type.
- Calculation as a percentage of gross sales, percentage of net sales, dollars per case, or dollars per UOM.
- Definition by all, group, and table for customer and item.
- Effective date and expiration date.

Payments and accruals can be calculated monthly, quarterly, or yearly.

In most rebate and trade promotion programs, the manufacturer pays different customers in different ways. Some customers will have the rebates or merchandising allowances credited to their accounts, while others will request direct payment.

Reporting and Documentation
Managers can access easy-to-read reports that reflect actual sales amounts (the invoice amount after all discounts, rebates, and trade spending allowances). With this reporting capability, managers can assess the true margin generated by specific items or programs.

The solution also provides a monthly report by customer that shows:
- Opening accrual amount
- Additional accruals
- Payments and accounts receivable (A/R) deductions
- Closing balance

Process Industries for Microsoft Dynamics AX also creates a rebate and TMA statement for each customer. Using this report, the customer and the manufacturer’s salesperson can see what credits the customer has earned over a given time for various products and programs, helping to keep salespeople informed and strengthen customer relationships.

An Integrated Business Management Solution
Process Industries for Microsoft Dynamics AX combines a proven, tested platform—Microsoft Dynamics AX—with powerful process manufacturing and distribution capabilities. In other words, it provides a complete, end-to-end business management solution tailored specifically for process manufacturing companies.
Solution Map
Process Industries for Microsoft Dynamics AX provides the industry-specific capabilities and functionality manufacturers need to optimize their operations.

A Flexible, Scalable Platform
Process Industries for Microsoft Dynamics AX has built-in flexibility and scalability to help manufacturers expand operations or extend their solutions. The layered solution architecture enables businesses to customize one tier without affecting functionality on others. As a result, the potential risk of customization and upgrades is reduced, helping to ensure a long-term solution with a low total cost of ownership (TCO).

Maximizing IT Investments
With Process Industries for Microsoft Dynamics AX, employees can count on a familiar user experience with an intuitive interface that’s similar to other Microsoft software. It also exploits the capabilities of the full range of Microsoft products, including the 2007 Microsoft® Office system. Tight integration with powerful Microsoft technologies such as Microsoft SQL Server®, Microsoft BizTalk® Server, and Windows® SharePoint® Services can help companies maximize the value of their existing IT investments.

Microsoft Quality Assurance and Support
The reliability, connectivity, and performance of Process Industries for Microsoft Dynamics AX are backed by Microsoft quality assurance and support. To provide high quality and excellent value, Process Industries for Microsoft Dynamics AX has been reviewed by Microsoft internal development and quality assurance staff and is supported by Microsoft Support Services. A manufacturer can count on receiving
support for the entire solution from one central location, rather than having to contact different people and organizations for different support needs. In addition, technical reviews of the solution prior to launch and throughout the product lifecycle helps ensure greater overall quality, performance management, and stability through service packs or major releases.

**Conclusion**

To remain competitive, process manufacturers must overcome many challenges, including local and global competitors, increasing regulatory requirements, inventory and resource availability and allocation issues, and operational inefficiencies and constraints. Process Industries for Microsoft Dynamics AX provides powerful, flexible tools for process manufacturers to streamline their front-office and back-office operations, maximize the return from their current customer bases, win new customers and the loyalty of returning customers, and more quickly react to market shifts and new business opportunities.

Process Industries for Microsoft Dynamics AX can be tailored easily with add-on functionality while still maintaining low total cost of ownership, so manufacturers can adapt and upgrade their solutions over time with less risk and expense. The highly flexible, layered architecture enables Microsoft partners to provide valuable customizations and extensions to the Microsoft Dynamics AX product line to fit each customer’s unique process manufacturing requirements.

Manufacturers can invest in their futures by using a solution backed by a vast network of Microsoft Partners and independent software vendors, all dedicated to helping ensure that their Microsoft Dynamics AX solutions change and grow in pace with their businesses.

Microsoft believes that the key to helping businesses be more agile is empowering individual workers with tools that improve efficiency, enable them to focus on the highest-value tasks, maximize the impact of employees and workgroups, and drive deeper connections with customers and partners. With Process Industries for Microsoft Dynamics AX, process manufacturers can identify more efficient ways to implement best practices, communicate with their extended supply chains, gain deeper insight into their businesses with real-time information, and more quickly take advantage of new business opportunities.
## Features Summary

The following features summary represents functionality in Microsoft Dynamics AX 2009 and Process Industries for Microsoft Dynamics AX 2009.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Feature Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>21CFR Part11</td>
<td>Process Industries for Microsoft Dynamics AX enables users to more easily comply with FDA regulations such as 21 CFR Part 11 in the use of their enterprise systems by providing support for electronic signatures as well as complete audit control of the changes made throughout the system.</td>
</tr>
<tr>
<td>Actual recipe</td>
<td>The actual recipe captures true raw material, machine usage, and labor consumed during production. While the standard, adjusted, and actual recipes may be the same, most often changes are made during production and captured through shop floor reporting.</td>
</tr>
<tr>
<td>Adjusted recipe</td>
<td>The adjusted recipe is a one-time change made to a standard recipe while the production batch is in planned status. This change enables the production manager to substitute raw materials or specify different direct amounts of ingredients than the standard recipe specifies. Such changes usually are made because of conditions unique to the given batch run.</td>
</tr>
<tr>
<td>Assay/Potency concentration</td>
<td>Some items must be tested for the concentration of their contents in order to determine the actual quantity of the product to be consumed or sold. Concentration is the ratio of the quantity of the active ingredient being measured to the total volume of the sample.</td>
</tr>
<tr>
<td>Best Before</td>
<td>The duration (measured as a number of days, months, or years from the production date) used by the system to calculate the date before which a given lot should be consumed, after which, stated quality cannot be guaranteed.</td>
</tr>
<tr>
<td>By-product</td>
<td>A by-product, like a co-product, is a secondary item resulting from a production run. Unlike a co-product, a by-product is unplanned and may be disposed of, potentially at a cost. Regardless of final disposition, by-products are the result of a production run and are tracked as an item when received into inventory. By-products can have positive or negative cost impacts on co-products.</td>
</tr>
<tr>
<td>Campaign scheduling</td>
<td>Process Industries for Microsoft Dynamics AX provides the ability to schedule similar products together and sequence the schedule in order to minimize setup and changeover time.</td>
</tr>
<tr>
<td>Catch or nominal weight</td>
<td>Catch weight is the actual weight of an item or a group of items considered together, as opposed to the standard or theoretical weight of a container or item. For example, the theoretical weight of a case of meat is 10 pounds, but the actual or catch weight of the same case at time of production is 9.5 pounds.</td>
</tr>
<tr>
<td>Feature</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Commodity pricing</td>
<td>Commodity pricing is an extension of commodity costing in Microsoft Dynamics AX. It enables users to rapidly react to the changing cost of raw materials and reflect those changes effectively in the sales price of the end items consuming those raw materials. This affects the sales price for all or specific customers or customer groups.</td>
</tr>
<tr>
<td>Computer-aided formulation</td>
<td>Computer-aided formulation (CAF) provides users with advanced scaling and management of dependencies between raw materials while making changes to an existing recipe.</td>
</tr>
<tr>
<td>Co-product</td>
<td>A co-product is a secondary product that is planned for in addition to the main end item in a production order. In certain industries, such as meat processing, co-products are actually just multiple items that will come out of a production order at the same time (since there is no main end item). Other industries with this outcome include pulp and paper, metals processing, and chemicals. A co-product can either serve as a raw material in the production of another end item or be sold as a finished good.</td>
</tr>
<tr>
<td>Item substitution</td>
<td>Users can substitute equivalent or replacement items for finished goods or raw materials, including “use-up effectivity,” while maintaining complete tracking and history.</td>
</tr>
<tr>
<td>Lot control</td>
<td>The lot control parameter determines if the product will be managed and tracked as part of a specifically identified grouping (a lot). Available options are by lot (multiple units will make up a lot), by unit, and not applicable.</td>
</tr>
</tbody>
</table>
| Materials Safety Data Sheet (MSDS) management | MSDS management includes the following parameters:  
  - Is it the first time a customer has ordered the product?  
  - Has a new MSDS sheet been assigned to an item used in a recipe?  
  - Has it been three years since the last change to the product?  

In each scenario, the user will be prompted to send the MSDS sheet to the customer. |
<p>| Percentage recipe               | The percentage recipe parameter defines how the ingredients or materials of the recipe are defined. If this field is set to “Yes,” then some materials can be entered as percentages (raw material quantities must equal 100 percent). If the field is set to “No,” then raw materials can be entered only as absolute quantities. |
| Quantity non-dependent or constant | This parameter indicates that material requirements are not affected by the size of the production batch. If a batch quantity is changed, the raw material quantities are adjusted proportionally. |
| Rebates and trade spending      | Many process manufacturers, especially those in consumer packaged goods and commodity industries, employ rebates, and trade spending programs to promote their products. Manufacturers can define rebates and trade merchandise allowance programs, pay the participants, and account for the results. |</p>
<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recipe size</td>
<td>Recipe size defines the default quantity of an item to be produced, as specified in the recipe. For example, no less than 500 pounds of an item may be produced in a single batch. Users can define production constraints such as maximum batch size. So, in this example, if the manufacturing order requires 1,000 pounds be produced, the system will launch two 500-pound orders to fulfill the requirement.</td>
</tr>
<tr>
<td>Regulatory reporting</td>
<td>Process Industries for Microsoft Dynamics AX manages various environmental reporting requirements (such as OSHA reporting) and some of the necessary usage information as dictated by the government.</td>
</tr>
<tr>
<td>Rework work orders</td>
<td>A rework work order is a production order for repeating specific production steps to correct or remanufacture an item that has failed quality tests. The item is reworked through the production process to help ensure that it meets quality specifications. A rework order differs from a regular production work order because the raw material and the finished good are the identical item, but additional costs for either the reprocessing or additional raw materials are added to the reworked finished item.</td>
</tr>
<tr>
<td>Sales pegging</td>
<td>Process Industries for Microsoft Dynamics AX enables users to link a specific sales order to a specific manufacturing order.</td>
</tr>
<tr>
<td>Scalable</td>
<td>The Scalable parameter indicates that if the quantity or amount of a particular raw material is changed, then the system should also adjust the batch size proportionate to the change in quantity of the scalable raw material. If the scalable parameter equals “Yes,” then other scalable quantities in the formula are adjusted. For example, if a scalable raw material is increased by 10 percent, then the batch size will be adjusted accordingly, as will the quantity of all other raw materials that have the scalable flag set to yes.</td>
</tr>
<tr>
<td>Shelf advice</td>
<td>The number of days, months, or years after which a lot should be retested to ensure that it is still good. Process Industries for Microsoft Dynamics AX flags the item and notifies the user that retesting is required.</td>
</tr>
<tr>
<td>Shelf life</td>
<td>The period of time a product remains effective, as measured in days, months, or years. Reports and picking strategies are determined based on the shelf life for a particular lot, using FIFO or FEFO rules.</td>
</tr>
<tr>
<td>Shrink factor</td>
<td>The shrink factor defines the percentage of the raw material that is lost because of evaporation, absorption, and so on. Shortages of raw materials can be prevented in production by assigning a shrinkage factor to a specific item during planning. Based on the shrink factor, Process Industries for Microsoft Dynamics AX will recommend greater material quantities (for example, if the shrink factor is five percent, then five percent more than the net quantity will be allocated to production).</td>
</tr>
<tr>
<td>Specific gravity</td>
<td>The unit of measurement conversion for weight to volume and reverse.</td>
</tr>
</tbody>
</table>
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IMPLEMENT BEST PRACTICES, GAIN INSIGHT, AND PROMOTE EFFICIENCY WITH PROCESS INDUSTRIES FOR MICROSOFT DYNAMICS AX

<table>
<thead>
<tr>
<th>Split lots</th>
<th>In some circumstances, a lot of material or items may be divided into two or more new lots. When a lot is divided, each of the resulting smaller lots inherits or assumes the characteristics of the original lot. That is, the new lots retain the history and relevant qualities of the original lot. For example, in paper and basic metals processing, the manufacturer often produces a master roll that is then split into sheets or rolls of different widths. Each narrower roll (or lot) inherits the characteristics of the original lot (master roll).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard recipe</td>
<td>A standard recipe is defined as the set amount of raw materials, containers, co-products, and by-products to which all actual usage will be compared. Planning and costing engines use the standard recipe, although there may be several one-time changes to a recipe at the production batch level.</td>
</tr>
<tr>
<td>Total Quality Management</td>
<td>The Total Quality Management (TQM) module enables a manufacturer to ensure that its operations meet the quality standards defined by the company.</td>
</tr>
<tr>
<td>Unit of measure (UOM)</td>
<td>Although every defined item must have a base UOM for inventory valuation, most process items are packaged, stored, and sold using different types of containers and, therefore, different units of measure. For example, bulk materials can be purchased in pounds or gallons and later sold in kilograms or liters. A company’s standard UOM—used to value inventory, establish recipe quantities, and so on—must be linked to other units using a conversion factor. In Process Industries for Microsoft Dynamics AX, all UOMs are stored and maintained, rather than calculated each time they are used.</td>
</tr>
<tr>
<td>UOM types</td>
<td>There are six types of UOMs: weight, length, volume, piece, area, and general. At various stages, a given material may be maintained in different UOMs. When the product changes from one UOM to another, Process Industries for Microsoft Dynamics AX uses a predefined constant, or conversion factor, to translate the actual quantity from one unit of measure to another. For example, to convert from a volume UOM to a weight UOM, the system uses the specific gravity field maintained in the item master record.</td>
</tr>
<tr>
<td>Yield percentage</td>
<td>The yield percentage is the ratio of usable output from a process to its input. (For example, if the yield percentage is 95 percent, then usually five percent of a batch will be lost to spillage, evaporation, and other possible factors.)</td>
</tr>
</tbody>
</table>

For Additional Information