

# **Collaboration on PDM for CPG**

**A Partnership between a consumer products business and a technology innovator in PLM.**

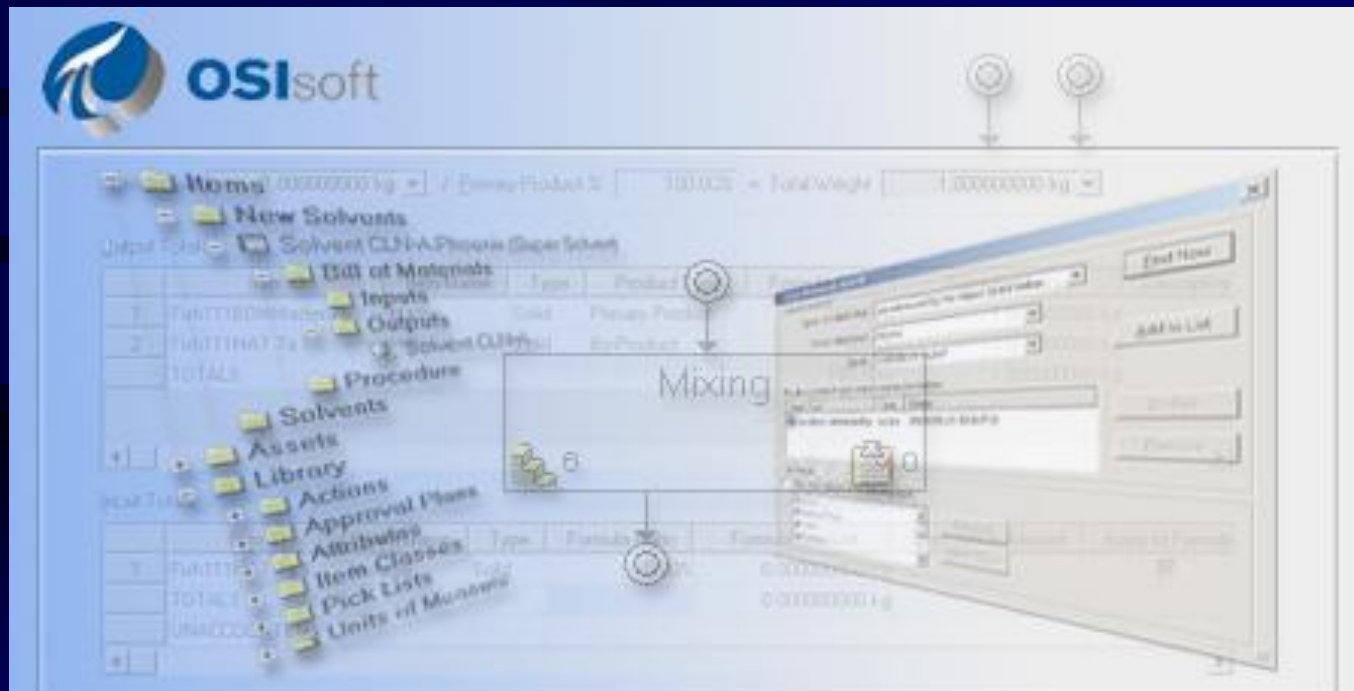
**Curt Funke**

**Divisional Vice President of Global Purchasing and Packaging**

**Ethan Fraley**

**Packaging Engineer**

# Alberto-Culver and ProcessPoint



# Consumer Product Focus

*ALBERTO CULVER*



A leading international manufacturer, marketer of personal care (hair and skin), food, and household products.

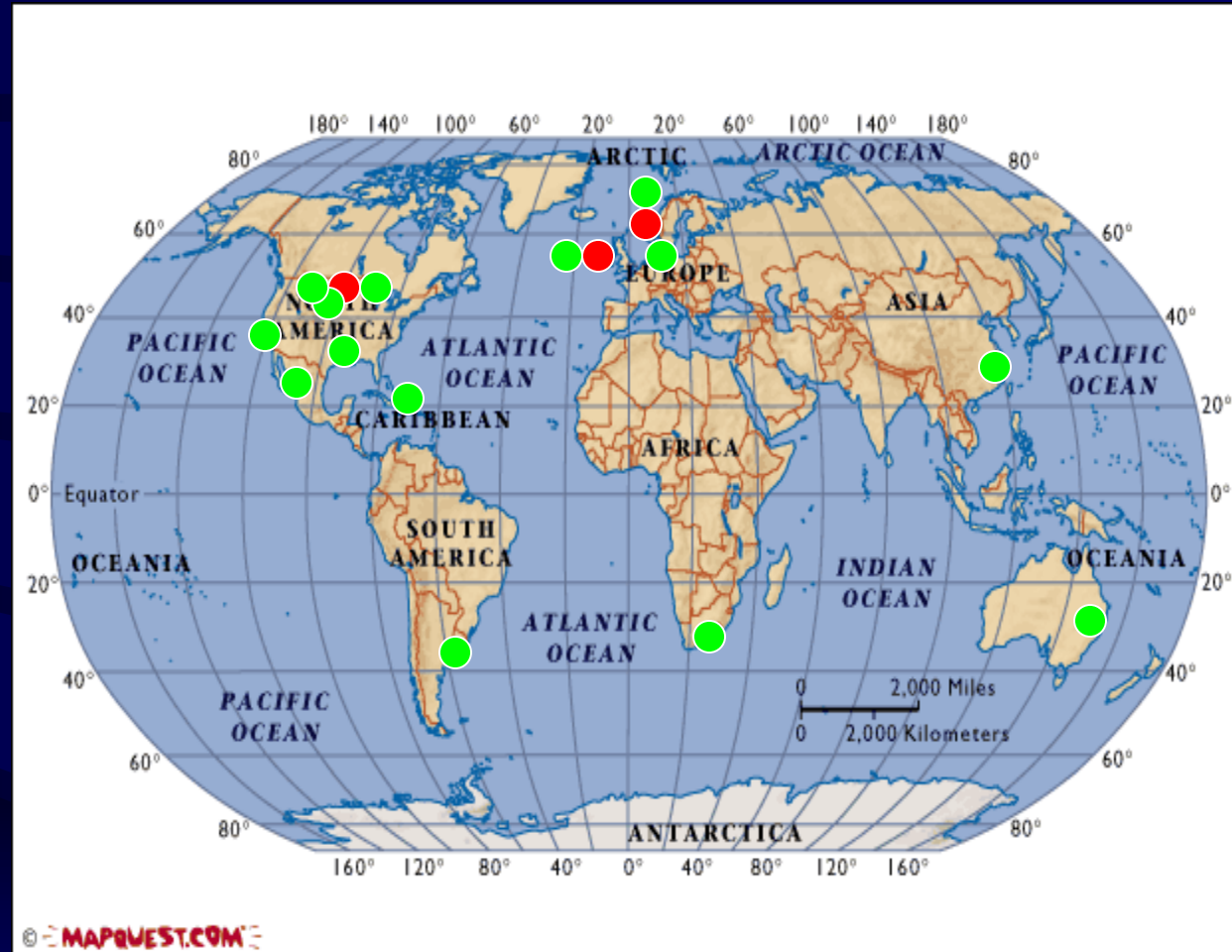
Also the world's largest retailer of professional hair care products with 2700 Sally Beauty Supply Stores

# Alberto-Culver Company

- Founded in 1955 by Leonard Lavin
- \$2.7 Billion dollars in annual sales
  - \$1.1 Billion in Consumer Product Manufacturing
  - \$1.6 Billion in Retail Sales from Sally Beauty
- 11 consecutive years of record Sales and Profits
- 6000 Products sold in more than 130 countries
- Over 300 new products launched globally in 2000
- Three product design centers and 14 manufacturing sites in 11 countries

# Alberto Culver Offices & Plants

- **14 Manufacturing Sites**
- **3 design centers**  
Chicago, Stockholm, Basingstoke UK.
  - Packaging
  - Formulation
  - Creative Design
- **1200 Direct Suppliers**
- **6000 Products sold in 130 countries.**



# **A.C. Aggressive Growth Plans**

- **Our company doubles it's size every five to seven years.**
- **New innovative products are the greatest contributor.**
- **Acquisitions have strengthened our growth and operations.**
  - **Pro-Line Corporation -1999**
  - **St. Ives Laboratories - 1996**
  - **Cederroth International - 1991**
- **Speed to market helps us to accelerate sales growth**
- **Effective supply chain management, purchasing tactics, and building supplier relationships help us drive profit improvement.**
- **Building our business through globally expanding our base line brands has been a major contributor.**

# **Business Challenges at Alberto Culver**

- **Rapid growth in new product introductions, promotions, and customer specific displays. Over 300 global new products and 250 promotional/display SKUs in one year.**
- **Faster product lifecycles leading to frequent redesigns, formula and graphics changes, and regulatory compliance.**
- **More granular attributes needed for supporting other systems such as WMS, e Sourcing, ERP, e Procurement, and CRM.**
- **Walmart and other retailers supporting on line catalogs from CPG manufactures sending data through the UCCnet by January 2004.**
- **Silos of product specifications in multiple business units not uniform, not connected, not complete (acquisitions, mergers).**
- **Finally...do more...with no additional head count.**



# **Alberto Culver Goals with ProcessPoint**

- **Collaborate on developing a complete and global product data management (PDM) system for our Company.**
- **To find a supplier that could help us to web enable our specification system so that it would be truly global with the reach and speed of the Internet.**
- **To enhance the quality of raw materials worldwide with uniform quality standards built into specifications with both English and Metric versions .**
- **To provide visibility to all manufacturing sites to the specifications for all our products being managed at our design centers.**
- **To reduce the redundancy and proliferation of new part numbers being added and to migrate to a global part numbering system.**



# Core Implementation Team

- OSI/Sequencia - Ray Hall, Tamara Schuryk
- Alberto Culver Company-
  - Ethan Fraley - Packaging
  - Nickie Cipicchio - Packaging
  - Mike Bugajsky - R&D
  - Bill Ward - Information Systems
    - Update the Steering Committee
    - Review progress, project issues, timeline/plans.
    - Define templates, workflow, security, approvals, testing, site needs.

# Users at Alberto Culver Company

- **Chemists**

- Responsible for formulations to meet product design goals and claims

- **Packaging Engineers**

- Responsible for design, testing, and material selection for bottles, labels, caps, cases, etc.

- **Process Engineers**

- Responsible for reliably batching and mixing the product to the specifications.

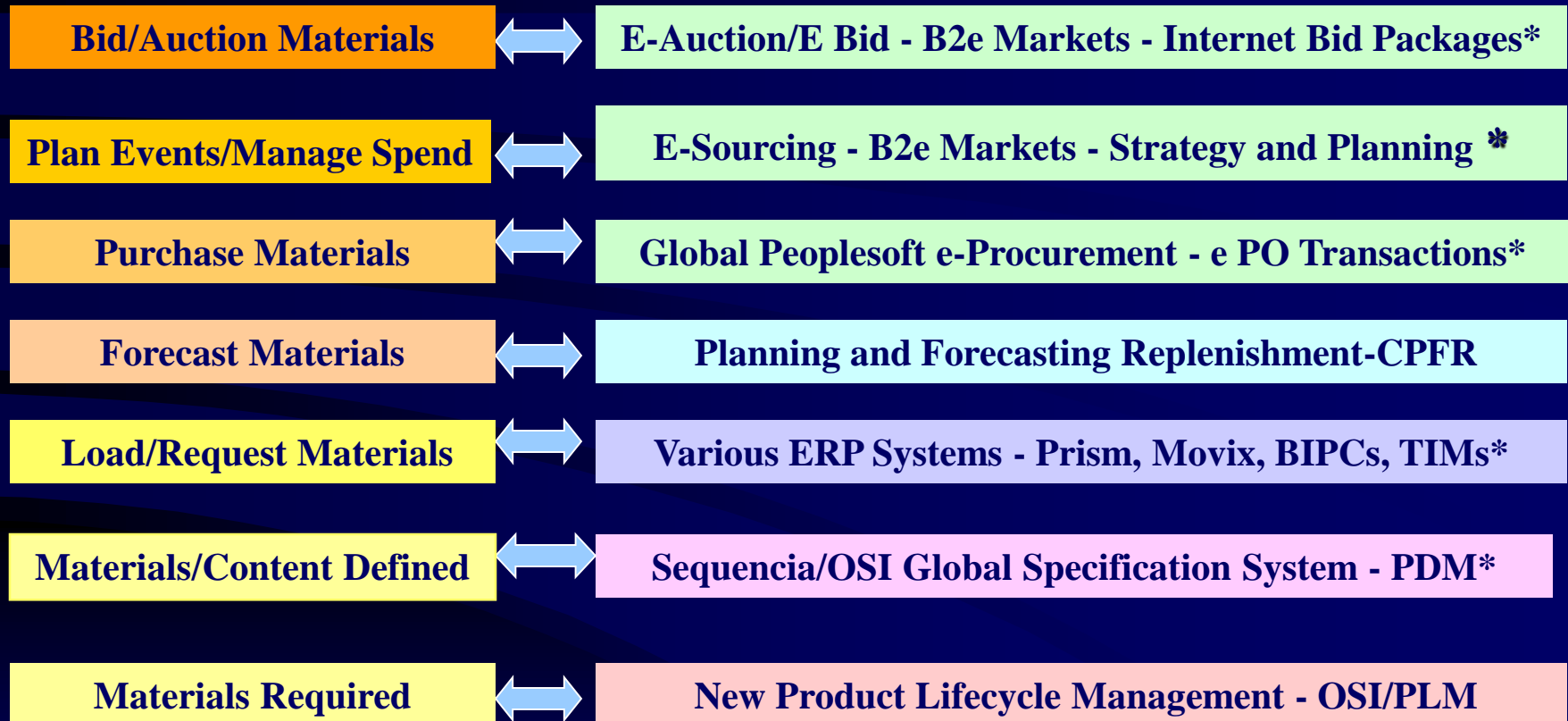
- **Read only users**

- Procurement, manufacturing, marketing, project management, planning, quality assurance, inventory control, etc.



# Purchasing & New Technology Platforms

## PDM and PLM is the foundation on which we build...



\* Investments already committed/projects underway

# Packaging Challenges with OSI/PDM

- To integrate our CAPE palletizing specification files into our PDM packaging BOMs.
- To be able to attach art files, and print cards to our printed packaging specifications.
- To automate (within the same spec) the conversion of English measurements into metric measurements for packaging sourced globally.
- To be able to attach Solidworks and AutoCAD files to all rigid packaging specifications.
- To increase the speed of navigation and productivity of the packaging engineers with the new PDM system.

# **Technical Goals & Challenges with OSI/PDM**

- **To integrate formula and batching instructions from the PDM system into our ERP systems for uploading.**
- **To transfer over 25,000 raw material specifications and 5000 BOMs out of our old PDM/LAN system into our new OSI/PDM system without losing any data, details, history.**
- **To install the new software and thoroughly test it before going live...without losing productivity in our departments.**
- **Hardware and networking upgrades were needed to help build the IT infrastructure.**
- **Improving the speed of product/packaging development with faster/automated workflows and approvals.**
- **Specifications, data, and line item attributes needed to support e Sourcing and e Procurement with PDF attachments.**

# e Sourcing tools need electronic Specifications...

**B2eSourcing - Microsoft Internet Explorer**

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites History Mail Print Edit Discuss

Address <https://training.b2emarkets.net/catmgt/initiator/framework/Index.jsp> Go Links

User Profile | Search | New Features | B2eKnowledgeLink | Logout

Projects Partner Center Inbox Reports **B2eSourcing™**

Desktop

- Direct Materials
  - Basic Materials
  - Chemicals
  - Hardware Fasteners
  - Packaging
  - Dispensing Closures**
  - Plastic
  - Rubber
- Engineered Products
  - Category
  - Components
  - Packaging
  - Raw Materials
  - Resale Products
- Metals
- Other
- Services

**Dispersing Closures** [coaching](#)

Strategy Development

Stakeholder Assessment

Spend Reporting

Cost Reduction Request

Industry Research

Request for Information

Request For Quote

Project Library

Not Started In Progress Completed

**Specifications come attached to Line Item Details on e bid packages & Auctions**

Internet

**PEOPLE<sup>®</sup>**  
*Soft*



## Supplier Portal View - PO Detail

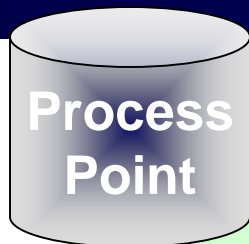
## Material Specifications Delivered as Attachments to “First Time Buy” POs



# Reducing Cost

- **ROI was built on the ability for us to achieve the following...**
  - **Consolidate part numbers globally and leverage spend on common materials.**
  - **To automate the uploading of specifications into regional and global bid packages in our Internet based e Sourcing solution. Giving suppliers electronic visibility to all the direct materials we purchase. We expect a 1% reduction in cost of goods that are bid.**
  - **Reduction of out of specification materials which leads to less rework, scrap losses, and downtime.**
  - **Fewer errors in production internally and externally at contract fillers.**

# ProcessPoint Provides the Architecture for worldwide collaboration on raw materials and formulations



R&D, Sweden

Mfg,  
Mexico

Purchasing, UK

processPoint PDM Editor - [11133346.Global (Acetone)] - D:\Documents and Settings\tschuryk.OS\Desktop\Demo Files for Generic Demo\ac

File Edit View Search Tools Help

Solvents - Properties

Items

- Misc Chemicals
- Products
- Solvents
- Assets
- Library
- Actions
- Approval Plans
- Attributes
- Item Classes
- Pick Lists
- Units of Measure

ACME Corporation Chemical Processing Division

Material Specification Sheet : Acetone Solvents

ID:11133346 Modification Date:13/19/2002

Version:0 Issue Date:

Description:Acetone is the simplest and most important of the ketones. It is a colorless liquid with a mildly aromatic odor. It is primarily used as a chemical intermediate, a solvent, a carrier for acetylene, and as a raw material for chemical synthesis.

Formula: CH3COCH3

Boiling Point: 56.2 deg C Molecular Weight: 65

Freezing Point: -142.0 deg C Viscosity: 1.3 cP

Melting Point: -94.3 deg C Kinematic Viscosity at 20C: cP

Flash Point: -20.0 deg C Kinematic Viscosity at 40C: cP

pH: Refractive Index: 1.359

Odor: fragrant, mint-like odor Upper Explosive Limit (%vol): 12.80 %

Density: 0.7857 g/cm3 Lower Explosive Limit (%vol): 2.60 %

CAS RN: 67-64-1 Fire Hazard Rating: 5

DOT Number: UN 1090 Health Hazard Rating: 3

DOT Label: Flammable Liquid

Storage and Handling:

Protective Eye Equip: Safety glasses with side shields

Protective Respiratory Equip: Air supplied respirator

processPoint PDM Editor - [11133346.Global (Acetone)]

File Edit View Search Tools Help

solvent-purchasing

Items

- Chemicals - Artificial Color
- Chemicals - Miscellaneous
- Chemicals - Solvents
- Food - Cocoa
- Food - Complex Ingredient
- Food - Dairy
- Food - Fats and Oils
- Food - Flavorings
- Food - Glazes
- Food - Marinades
- Food - Miscellaneous
- Food - Natural Sweeteners
- Food - Nutrients
- Food - Nuts and Fruits
- Food - Other Food
- Food - Poultry
- Food - Preservatives
- Food - Spices and Season
- Paper Grade
- Paper Grade.1
- Pkg - Bags
- Pkg - Bottles
- Pkg - Cans
- Pkg - Cartons

ACME Corporation

Purchasing Spec Sheet : Acetone

Class Chemicals - Solvents

Material ID:11133346 Spec Modification Date:13/16/2002

Material Version:0 Spec Issue Date:

Estimated Annual Volume 500000 gal

Material must conform to the following Purchasing Specifications:

Boiling Point: 56.2 deg C Molecular Weight: 65

Freezing Point: -142.0 deg C Viscosity: 1.3 cP

Melting Point: -94.3 deg C Kinematic Viscosity at 20C: cP

Flash Point: -20.0 deg C Kinematic Viscosity at 40C: cP

pH: Refractive Index: 1.359

Odor: fragrant, mint-like odor Upper Explosive Limit (% vol): 12.80 %

Density: 0.7857 g/cm3 Lower Explosive Limit (% vol): 2.60 %

Handling and Shipping Requirements for Supplier:

CAS RN: 67-64-1 Fire Hazard Rating: 5

DOT Number: UN 1090 Health Hazard Rating: 3

DOT Label: Flammable Liquid Label

Storage and Handling:

Protective Eye Equip: Safety glasses with side shields or goggles

Protective Respiratory Equip: Air supplied respirator

processPoint PDM Editor - [11133346.Global (Acetone)]

File Edit View Search Tools Help

Solvent P&ID

Items

- Chemicals - A
- Chemicals - M
- Chemicals - S
- Food - Cocoa
- Food - Complex Ingredient
- Food - Dairy
- Food - Fats and Oils
- Food - Flavorings
- Food - Glazes
- Food - Marine
- Food - Miscel
- Food - Nature
- Food - Nutritio
- Food - Nuts a
- Food - Other I
- Food - Poultry
- Food - Preser
- Food - Spices
- Paper Grade
- Paper Grade.
- Pkg - Bags
- Pkg - Bottles
- Pkg - Cans
- Pkg - Cartons

ACME Corporation, Inc. Chemical Processing Division

Material Specification Sheet : Acetone Chemicals - Solvents

ID:11133346 Modification Date:11/26/2002

Version:0 Issue Date:

Status: Developmental

Description:Acetone is the simplest and most important of the ketones. It is a colorless liquid with a mildly aromatic odor. It is primarily used as a chemical intermediate, a solvent, a carrier for acetylene, and as a raw material for chemical synthesis.

Synonyms:dimethylketal, pyroacetic acid, chevron acetone, Propanone, ketone propane, Acetone, Dimethyl ketone, Methyl ketone, 2-Propanone, Dimethyl formaldehyde, beta-ketopropane, pyroacetic ether

Chemical Structure

NFPA Label

Formula: CH3COCH3

Boiling Point: 56.2 deg C Molecular Weight: 65

Freezing Point: -142.0 deg C Viscosity: 1.3 cP

Melting Point: -94.3 deg C Kinematic Viscosity at 20C: cP

Flash Point: -20.0 deg C Kinematic Viscosity at 40C: cP

Michael Sauder / All Items

# **Global Specification System is rolling out...**

- **We are moving forward with rolling out our Global Specifications (PDM) system from OSI/Sequencia. All locations in North America are already installed.**

(Puerto Rico done 4/28, UK, Mexico, Sweden, Argentina, and Australia will be done this year)

- **This system will be integrated into our Global disparate ERP systems to allow our formula and batching instructions to upload automatically.**
- **This system will be accessed by suppliers in the future to allow suppliers and Alberto personnel to collaborate on design, material selection, and final specifications.**

# Summary

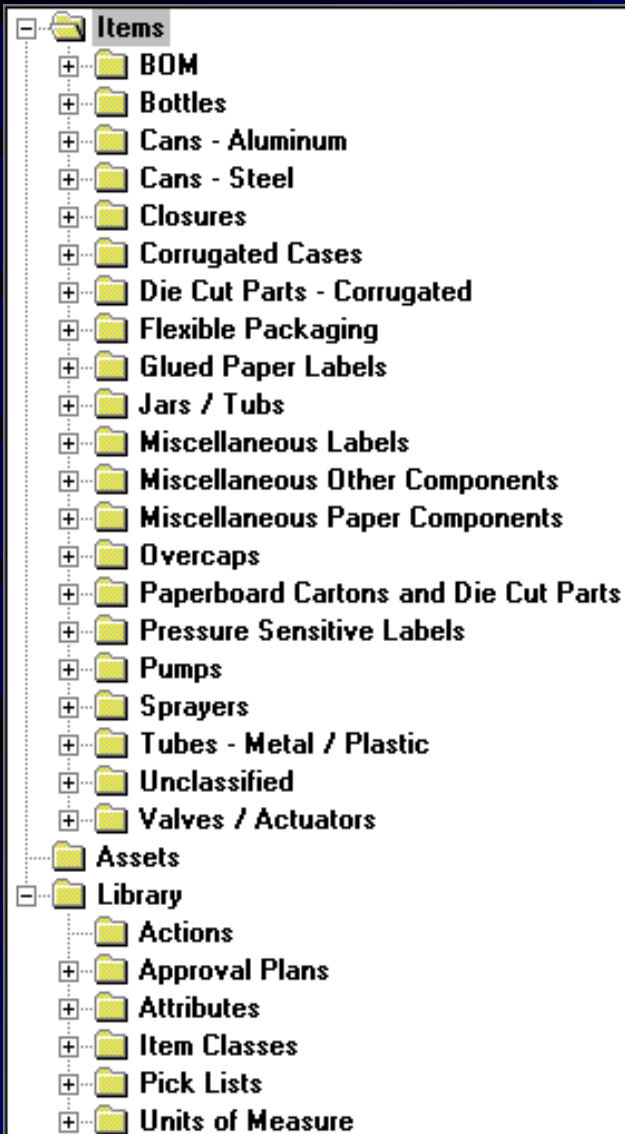
- **ProcessPoint is used Enterprise-wide to enable:**
  - **Global management of product specifications**
  - **Common system for formula, batching instructions, packaging and ingredient specs., and packaging BOMs/palletizing data.**
  - **Specifications available through the Internet to all sites**
  - **Raw material/part number consolidation**
  - **Enabling/automating strategic e Sourcing**
  - **Automated Approvals and Workflows**
  - **Automatic transfer of information to various ERP systems.**
  - **Enables collection of data for other systems and UCCnet.**

# ProcessPoint - PDM Editor

The screenshot displays the **processPoint PDM Editor - [Library Objects]** window. The interface includes a menu bar (File, Edit, View, Search, Tools, Help) and a toolbar with various icons. On the left, a tree view shows the library structure with folders for **Items**, **Assets**, and **Library**. The main workspace contains a process flow diagram with a central **Mixing** unit. A **Process Properties** dialog box is open, showing input and output streams. The diagram also includes a **Bill of Materials** table and a **Procedure** section. The **OSIsoft** logo is visible in the top left of the workspace. The status bar at the bottom indicates **Done** and **Ethan Fraley MP Packaging**.

processPoint PDM Editor®

# PDM Hierarchy



Product Data Management (PDM) consists of the following:

## Items

—contains all specifications within each Item Class

## Library

—contains a standard set of objects used to build specifications.

# PDM Nomenclature

- Specifications must be assigned the following:
- **ID (part number)**
  - any alpha-numeric combination
- **Variant**
  - Distinguishes between items that differ only slightly (ex. Global vs site specific component)
- **Version**
  - Distinguishes between modifications of the same specification (ex - correct typo's)



The screenshot shows a software window titled "Identity" with a small icon of a box and a bottle. It contains three input fields, each preceded by a yellow key icon:

Field	Value
ID	VS11 07
Variant	GLOBAL
Version	31

**Each ID.Variant.Version is unique.**



# What is a Bill Of Material (BOM)?

- Same As Finished Goods
  - defines packaging components
  - package/product dimensions
  - palletization/distribution info

# BOM Hierarchy

## Normal Shampoo 15 oz Pallet

- ❖ Pallet



- ❖ 100 -12 count cases 15 oz V05 Normal Shampoo

- ❖ Shrink Wrap

## Normal Shampoo 15 oz

- ❖ Clear plastic 15 oz bottle

- ❖ 15 oz snap bead dispensing closure

- ❖ V05 Normal Shampoo front label 15 oz

- ❖ V05 Normal Shampoo back label 15 oz

- ❖ Corrugated shipping case



# BOM EXAMPLE

## ALBERTO-CULVER USA

IBU(Division): PERSONAL CARE

## PACKAGING COMPONENT LISTING

### BILL OF MATERIALS

Packaging Objective: Comm. Announcement  
 Project Number: VOV-207  
 Implementation: PHASE IN  
 Ship Date:  
 Package Type: OPEN STOCK  
 Pallet Data: EXIST DATA/PATTERN

Status: **Approved**  
 Catalog No. (+Whs Ver): VS11 07  
 Variant: GLOBAL  
 Version: 31  
 Effective Date: 10/28/02  
 Supersedes Date: 02/06/2001

Product Name: VO5 Shampoo -- Normal

Size & Package: 15 FL OZ Plastic Btl  
 Case Pack: 12 Bottles  
 Shelf Pack: Split-Apart 6  
 OTC?: NO

WIP Catalog Number:  
 Item UPC Number: 0-22400-00030-5  
 Case UPC Number: 1-00-22400-00030-2

Explanation: Formula change; New front/back labels; Whs Ver; New Shipping Case

Part Number	Variant	Status	Packaging Material Description	Comments	Quantity
12131150	GLOBAL	Approved	PLASTIC BOTTLE UNDECORTD	AC - Snap bead neck	12
12131120	GLOBAL	Approved	PLASTIC BOTTLE UNDECORTD	Alternate Outside	--
12132301	GLOBAL	Approved	DISPENSING CLOSURE	Seaquist, Platinum	12
15403002	GLOBAL	Approved	PS FILM LABEL-FRONT	2 3/8" x 4 5/8"	12 *
15403102	GLOBAL	Approved	PS FILM LABEL-BACK	2 1/8" x 4 5/8"	12 *
10305102	GLOBAL	Approved	SHIPPING CASE - SPLIT APART	Phase IN - Generic	1 *
10305101	GLOBAL	Approved	SHIPPING CASE	Phase OUT - Generic	-- *

## PALLETIZING DATA

### CASE PACK INFORMATION

	Length	Width	Height
Case ID (in.):	12.88	5.31	9.31
Case OD (in.):	13.13	5.56	9.81

Case Cube: 0.41  
 Gross Case Weight: 14.00 lb  
 Total Load Weight: 1450.00  
 Pallet Graphic File: See Related Documents Tab  
 CAPE Filename: VS11-04

### UNIT LOAD SUMMARY

Pallet Type: 48 x 40  
 Cases / Tier: 25.00  
 Tiers / Pallet: 4.00  
 Cases / Pallet: 100.00  
 Pallet Height: 44.75  
 Footprint (L x W): 46.50 in. x 39.38 in.  
 Packing Instructions File:

CAPE Solution Number:

### SPECIAL INSTRUCTIONS

SECURELY STRETCH WRAP ENTIRE PALLET.

### APPROVALS:

321 - Packaging Engineer  
 320 - Packaging Manager

Nickie Cipiochio  
 Bob Novy

10/28/02  
 10/28/02

# What is a Packaging Component?

- Defined by:
  - material of construction
  - dimensions
  - structural drawings
  - performance (product protection)
  - graphics, text
  - quality standards

# Packaging Component Specification Example

ALBERTO-CULVER USA		PACKAGING MATERIAL SPECIFICATIONS	
IBU (Division): PERSONAL CARE		Corrugated Cases	
Item Name:	SHIPPING CASE - SPLIT APART	Status:	<b>Approved</b>
Spec Create Reason:	EXISTING	Part Number:	<b>10305102</b>
Open Stock?	YES	Variant:	GLOBAL
<u>Supersedes</u>		Version:	1
Part Number:	103051-02v0	Issue Date:	2/20/03
Issue Date:	12/20/02	Modification Date:	2/20/03
Catalog Number:	VARIOUS	Unit Count:	12
Product Description:	VO5 -- Base, Herbals, & Naturals -- Shampoo & Conditioner -- Split Apart Generic Case		
Style: DIE-CUT			
Split Apart Case?	YES	Flute:	B
ECT:	32 lbs/in	Board Test:	200
Manufacturer Joint:	GLUED INSIDE		
Structural Drawing File: Wabash CAD design #1889			
<u>Dimensions</u>		<u>Metric Dimensions</u>	
I.D. (inches): 12.8750 (L) x 5.3125 (W) x 9.3125 (D)		I.D. (mm): 327 (L) x 135 (W) x 237 (D)	
O.D. (inches): 13.1250 (L) x 5.5625 (W) x 9.8125 (D)		O.D. (mm): 333 (L) x 141 (W) x 249 (D)	
Blank Size (inches): 14.8750 Corr Dir x 50.7500		Blank Size (mm): 377.8250 Corr Dir x 1289.0502	
Square Feet: 5.2424		Cube: 0.4146 cubic feet	
		Square Meters: 0.4870	
		Cube: 0.0117 cubic meters	
Material: KRAFT 2 SIDES			
Liner Combination: 35HR / 26#SC / 35HR		Internal Arrangement: 3L x 4W X 1D	
Adhesive: STANDARD			
Printing Method: FLEXOGRAPHY		Number of Colors: 1	
GCM Colors: #90 BLACK			
Print Spec Number: PS11521		WHS Version Number:	
UPC Number: NONE		Sally Number:	
UPC Remarks: INKJET PRINTED ON LINE			
U.N. Test Required? N		U.N. Number:	
U.N. Remarks:			
Miscellaneous: Alternate 200 lb liner is 42k/26#sc/42k. The catalog number, warehouse version number and product description are also ink jet printed.			
Pallet Load Labeling: All pallet loads must be labeled with PO# and Part #.			
Unitizing Instructions:			
General Spec Number: GS-0007 & GS-0020		Project Number: ECO020	
ILS? NO		ILS No.: N/A	
Remarks: NEW PRINTING PLATE GRAPHICS, ATTACHED PRINT SPEC		Tare Wt: 10.60 Ounces	
<u>APPROVALS:</u>			
320 - Packaging Manager		Approved Vendors:	
Bob Novy		254150	
2/20/03			

# Creating Specifications

- Specifications can be created two ways
  - Create New
  - Duplicate by copy
    - Create new version
      - Add a CAD drawing
    - Create new copy by ID and Variant.

# Specification Status

- Levels:
  - Developmental (default for newly created specifications)
  - Awaiting approval
  - Approved
  - Obsolete



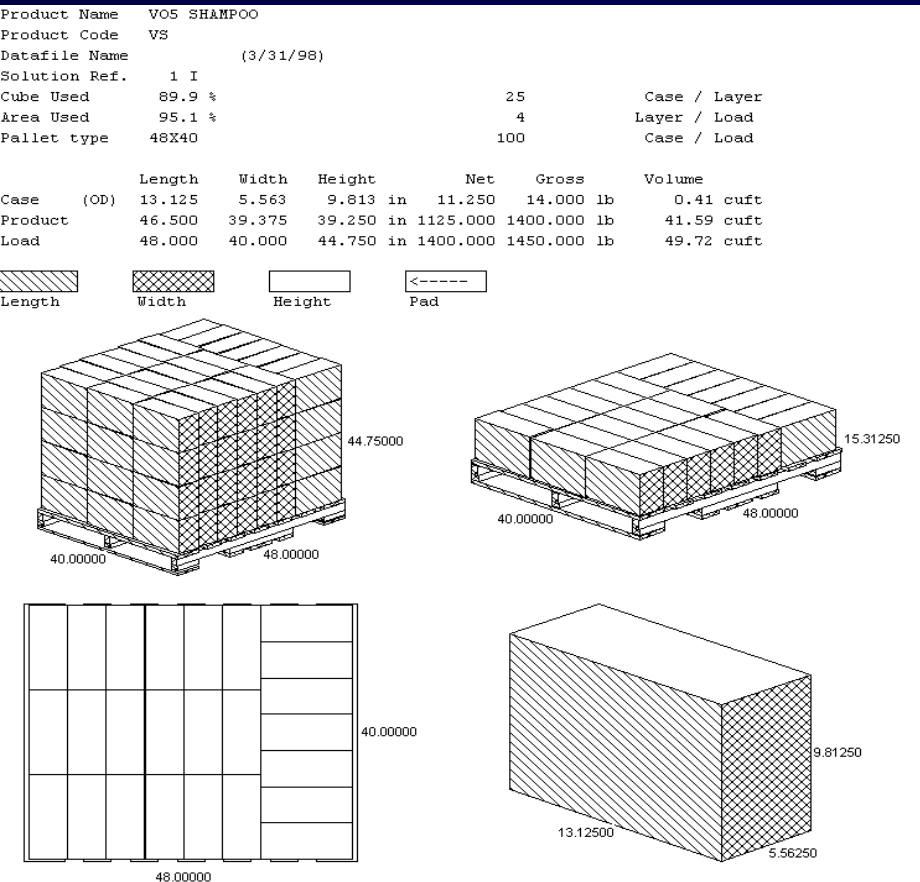
# How are Specifications Approved?

- Users configure a set of parallel and/or serial steps for assigned approvers.
  - Parallel: Users can approve at same time
  - Series: Users must approve in a certain order
- Changing spec status to “Awaiting Approval” begins the electronic approval process.
- When all the approvals have been granted, the spec automatically transitions from “Awaiting Approval” to “Approved”

# Related Documents

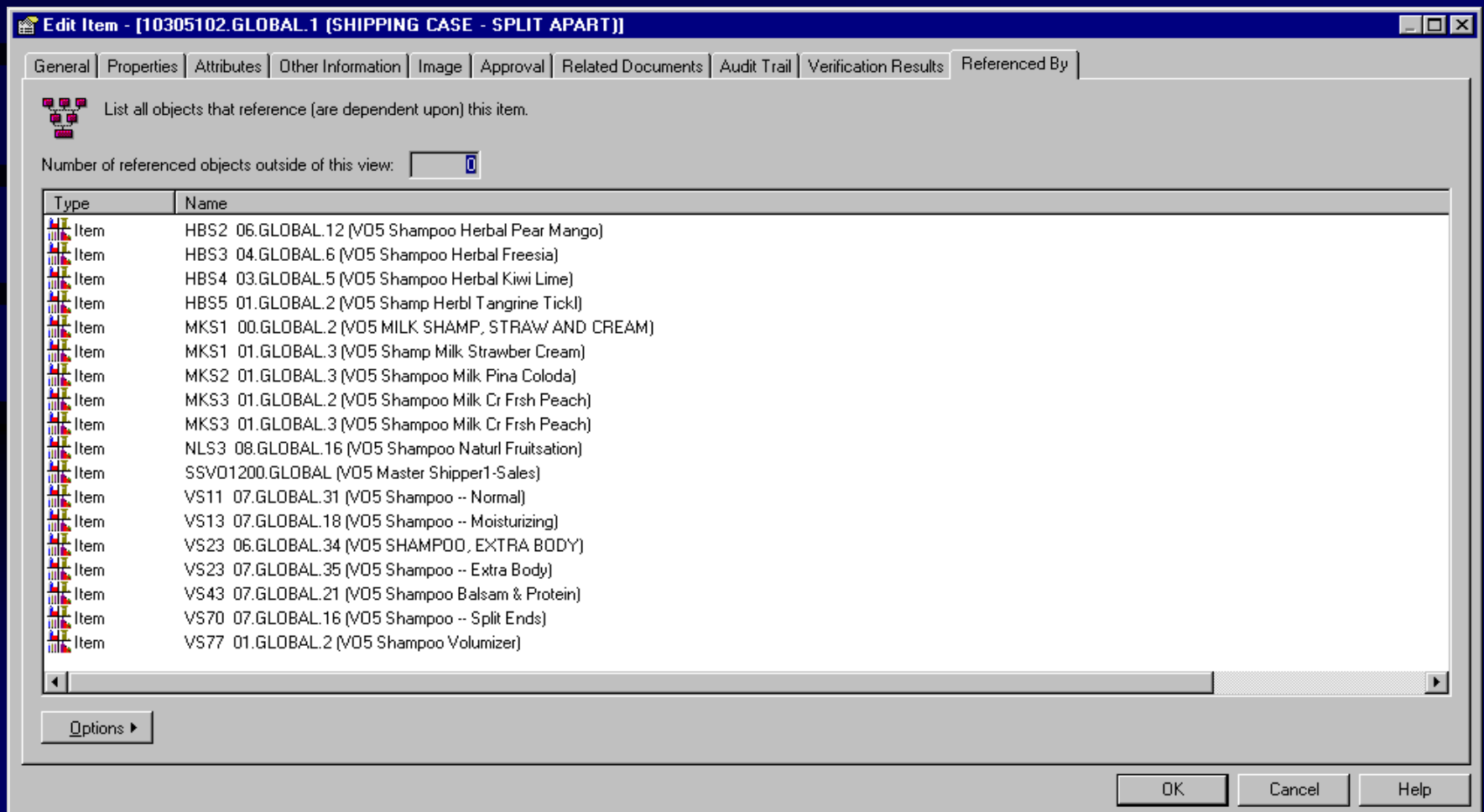
- Used to attach relevant files to a specification.
- Related Documents help to more fully define an object, for example:
  - CAD, PDF files
  - Pallet Pattern
  - MSDS
  - QA documentation
- All files types are supported as attachments i.e. (.xls, .pdf, .doc). However, each computer must have the appropriate program to open the file.

# Related Documents Example



# Referenced By (“Where Used”)

- Displays a list of all Components and/or BOM's that reference the specification.










# Search Capabilities

- Quick Search
  - basic query for part numbers, catalog numbers, etc based on limited search criteria.
- Smart Search (Parametric Search)
  - advanced query based on specific criteria such as attributes, related documents, common sku names (ex. VO5), spec status, spec creation date, etc.

# Document Inbasket

- Displays a current list of all specifications to be approved by an assigned user.

<div>View Object    Approve / Reject    Clear Notification    Refresh    Close</div>							
Type	Name	Status	Date / Time	Approval Type	Approving Group	Approval Role	Assigne ▲
 Item	CFHS2N02.GLOBAL.4	Waiting for Response	10/14/02 1:37:44 PM		320 - Packaging Manager		Bob No
 Item	12963101.GLOBAL.0	Waiting for Response	10/21/02 1:39:45 PM		320 - Packaging Manager		Bob No
 Item	12963001.GLOBAL.0	Waiting for Response	10/21/02 1:39:01 PM		320 - Packaging Manager		Bob No
 Item	15473102.GLOBAL.0	Waiting for Response	10/21/02 1:37:49 PM		320 - Packaging Manager		Bob No
 Item	15473002.GLOBAL.0	Waiting for Response	10/21/02 1:37:11 PM		320 - Packaging Manager		Bob No
 Item	15463102.GLOBAL.0	Waiting for Response	10/21/02 1:36:19 PM		320 - Packaging Manager		Bob No
 Item	15463002.GLOBAL.0	Waiting for Response	10/21/02 1:35:44 PM		320 - Packaging Manager		Bob No

# PDM Security

- User rights are configured for individuals who are placed into a security group.
- Security Views control the access of a group to “data silos”. Each silo can store information regarding a specific manufacturing plant, technical center, etc.
- Each security view has established permissions to various or specific silo’s. Permission options are view only, write, administrate, delete or none.
- Example
  - CLA facility is a contract filling operation for personal care/cosmetic industry. PDM has the ability to secure CLA’s “data silo” from non-CLA users.



# Security Permission Levels (User Rights)

◆ Delete

- Delete specifications

◆ Administrate

- Assign spec routing & approval

◆ Write (Author)

- Create, modify, and approve specs.

◆ Read (View)

- View Only

◆ None

more secure



# Other Functions of PDM

- Maintaining the library
  - Units of Measure
  - Approval plans
  - Data model design for materials and products
- Maintaining security
  - Adding and removing users
- Work offline
- Extensive audit history
- Units of measure conversions
- Vendor/Supplier access
- CAPE palletization data

# **Use scenario: create a general specification for a new or existing product**

- To Create or Duplicate a Specification.....
  - Search database for one with similar characteristics
  - Duplicate existing to a new version, or new name
  - Change specification
  - Change the bill of material
  - Route the new specification for approval