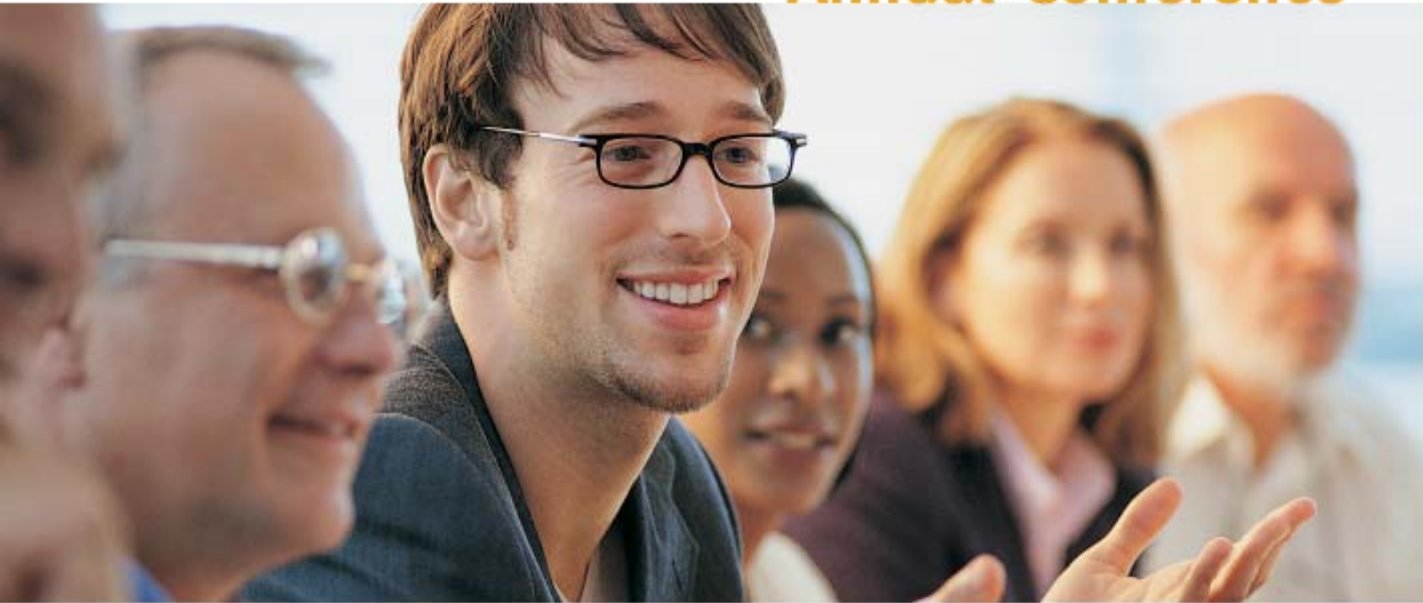


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U.S. Navy: Interchangeability & Substitutability

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EDUCATING

NETWORKING

INFLUENCING

Learning Points

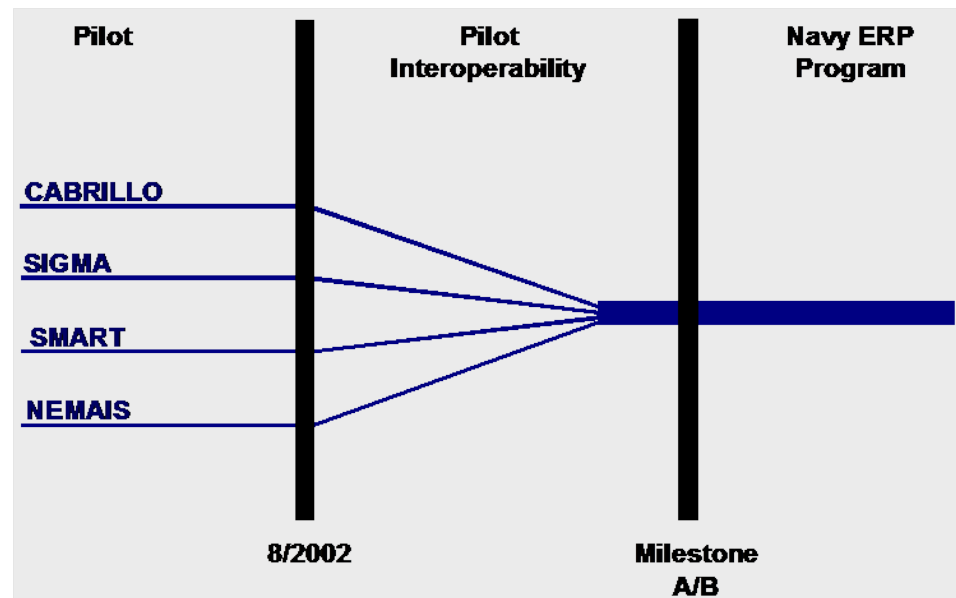
- Planning for Interchangeability of parts can significantly reduce an organization's inventory carrying costs and ultimately procurement spend.
- SAP provides two objects to accommodate interchangeability, FFF Classes and Supersession Chains, each of which function differently and should be used in different circumstances.
- Restricted relationships can not be effectively represented through standard SAP objects.

Agenda

- Introduction
- SAP Functionality
- U.S. Navy: Interchangeability & Substitutability
- Current design

Introduction to Navy ERP

- The Navy ERP Program was developed in response to the need to transform Navy business practices as expressed by the Chief of Naval Operation's vision in Sea Power 21 and the Business Management Modernization Program (BMMP)
- In December 1998, the Secretary of the Navy (SECNAV) Revolution in Business Affairs (RBA) Commercial Business Practices Working Group established four Navy ERP pilots as enablers for significant business process reengineering.
- In August 2002, the Assistant Secretary of the Navy (ASN) for Research, Development, and Acquisition (RDA) directed convergence of pilot management under one Program Management Office (PMO)



SAP Functionality

I/S DIMP – Aerospace & Defense provides the following objects to accommodate Parts Interchangeability:

- **Form, Fit, Function Class (FFFC)**
- **Supersession Chain (SSC)**
- **Parts Interchangeability Code (PIC)**

Form, Fit, Function Class

FFFCs are groupings of fully interchangeable parts that have identical technical properties in terms of form, fit, and function. In SAP, it is represented as a material and it serves to group parts together as a family.

A Manufacturer Part Number-Material Requirements Planning set (MPN-MRP set) is created as a subset of the FFFC.

Material Interchangeability Edit Goto Environment

Display of Full Interchangeabilities

Graphic

Material: MPN2222 : 61423
 FFF class: 013593731

Material	Name
MPN2222 : 61423	Pump Motor
MPN3333 : 61423	Pump Motor
013593731 : 61423	Pump Motor
013593731	PUMP CTFGL 50GPM

Table View Edit Goto System Help

Display of MPN-MRP Sets

Variable list

Material: MPN2222 : 61423
 FFF class: 013593731

MPN-MRP ...	Plant	Material	Leading Part
001	MC01	MPN2222 : 61423	<input type="checkbox"/>
001	MC01	MPN3333 : 61423	<input type="checkbox"/>
001	MC01	013593731 : 61423	<input checked="" type="checkbox"/>

Every MPN-MRP set has exactly one **leading part** that represents this MPN-MRP set from the MRP view

FFFC Integration

Core R/3 Integration Points

Purchasing:

- Material replacement is possible in RFQs, Quotations and Purchase Orders.

Forecasting:

- Consumption-based forecasting can be used to generate forecast requirements for the FFFC.

Material Requirements Planning:

- The system takes account of the pegged requirements and the replenishment elements for all parts in the same MPN-MRP set.
- A planned independent requirement for a part can be satisfied by another part in the same MPN-MRP set.
- Enhancement of stock/requirements list: you can access a period overview for a FFFC and a complete view for the other parts in the chain.

Master Production Scheduling (MPS) and Long Term Planning

- MPS and long-term production planning take account of MPN-MRP sets.

Stock overview:

- The user can display the stock situation for all members of the FFFC.

Sales and Distribution:

- The ATP check can be executed for FFFCs.

Plant Maintenance and Customer Service (PM/CS):

- In the manual availability check for maintenance and production orders, the system proposes other interchangeable parts if a material component is not available. For this purpose, the system takes into account all fully interchangeable parts in the same FFF class.

Input and Output Conversion of Manufacturer Part Numbers

- If you activate the conversion exit for material numbers, the system can find, identify, and display inventory-managed manufacturer parts using their manufacturer part number and their external manufacturer.

Supersession Chain

SSCs are normally used to reflect replacement parts, though it will allow the user to substitute for any part within the chain. It will also require the final part in the chain (the most preferred or the “head of family”) to be procured through planning.

Material Interchangeability Edit Goto Environment System

Maintenance of Supersession Chains

Material

Supersess.Chain

Material	Validity Date	Cause	Replacmnt
014493540			
014493542	02/14/2004	1107	I
014493543	02/14/2005	1110	I
014493544	02/14/2006	1109	I

A validity date conveys the time of replacement from part A to part B.

A reason code defines why the replacement is being made.

Replacement Type (1) 2 Entries Found

Interchangeability ty..	Short text
F	Forward
I	Interchangeable

Supersession Chain Integration



Core R/3 Integration Points

Purchasing:

- Material replacement is possible in requests for quotations, quotations themselves, in purchase requisitions, purchase orders and inbound deliveries.
- The user can verify an invoice and post the goods receipt if the purchase order is changed subsequently.

Forecasting:

- Consumption-based forecasting can be used to generate forecast requirements for the SSC.

Material Requirements Planning:

- Enhancements in MRP enable you to execute a requirements planning run for supersession parts.
- Enhancement of stock/requirements list: you can access a period overview for a supersession part and a complete view for the other parts in the chain.

Stock overview:

- The user can display the stock situation for all members of the SSC.

Sales and Distribution:

- Rescheduling can be executed for SSCs.
- The ATP check can be executed for SSCs.

Parts Interchangeability Code

A two digit code that is used to represent restricted interchangeability between two parts. It is used for substitution and inventory reporting. It does not integrate with MRP or the PVS (PM).

Table view Edit Goto Selection Utilities(M) System Help

New Entries: Overview of Created Entries

MPN2222:61423 : Allocate restricted interchangeable parts

Interchangeable Part	IC ...	Description IC Code
APL52A010003	06	Can be reworked into HOF

Cause of part exchange (1) 1 Entry fou

Restrictions

ICC	Catego ...	IC Code	Description
06	03		Can be reworked into HOF

two parts that have one-way or restricted interchangeability cannot belong to the same FFF class

Inventory Reporting

- Stock Overview
- Stock Requirements List

Stock Overview



This button allows you to skip to an individual material

Stock Overview for FFF Class: Co. Code/Plant/Warehouse/Batch

Members

Selection

Material	013593731	PUMP CTFGL 50GPM
Material Type	ZNSN	Interchangeable part
Unit of Measure	EA	Base Unit of Meas. EA
External Manufact		
FFF Class:	013593731	

Stock Overview for MPN-MRP Set

FFF Class Member	Unrestricted use	Qual. inspection	Reserv
013593731			9.00
013593731:61423			10.00
MPN2222:61423			3.00
MPN3333:61423	1.000		10.00

Stock Overview

Detailed Display

Client/Company Code/Plant/Storage Location/Batch/Special Stock	Unrestricted use	Qual. inspection	Reserved
Total	1.000		32
1767 Combined Atl & Pac Fleet	1.000		32
MC01 RMC Mid-Atlantic - Norfolk	1.000		32

Stock Requirements List

Stock/Requirements List for Supersession as of 17:48

Show Overview Tree

Material: 014490201 PARTS KIT-CENTRIFUG
 Plant: MC01 MRP type: PD Material type: ZNSN Unit: EA

A	Date	MRP e	MRP element data	Rescheduli	E	Rec./reqd.qty	Available qty	Stor	Material
	05/11/2006	Stock					48		
	11/01/2005	----->	Matl has been replace						014759498
	11/04/2005	PldOrd	0000005341/STCK		07	1	49		014490201
	11/05/2005	OrdRes	000004000005			1-	48		014490201
	12/01/2005	----->	Matl has been replace						015121274
	12/16/2005	POitem	4500000113/00010		20	10	58	0009	015121274
	03/01/2006	----->	Matl has been replace						014490201
	03/15/2006	POitem	4500000597/00010		20	9	67		015121274
	03/16/2006	ShpgNt	4500000602/00010		20	9	76		015121274

The (first) row of the MRP element *Stock* displays the cumulative stock of all parts in the MPN-MRP set or SSC

An icon allows the user to toggle in and out of either an MPN-MRP set or SSC

All of the requirements for each material in the MPN-MRP set or SSC are displayed cumulatively

Shortcomings

- FFFC – can only include fully interchangeable materials
- SSC – validity date driven; no functionality behind Cause Code
- PIC – can only be used with SSCs; not integrated to all processes

U.S. Navy: Interchangeability & Substitutability

Why is Interchangeability & Substitutability so important to the U.S. Navy?

- Total Value of Annual Demand = \$9.9 billion
- Non-family VAD = \$4.5 billion

Which areas are of critical importance?

- MRP – collective inventories must be considered; Head of Family always ordered
- Plant Maintenance – I&S relationships are important for configuration management during the repair cycle
- ATP – the least preferred material is depleted first



U.S. Navy: Interchangeability & Substitutability

- **Family Group Code (FGC)** – A code which identifies a family, and within a family, a group of related items which may, under specific conditions, be substituted for one another, and under which demand and/or assets may be consolidated for requirements determination.
- **Order of Use (OOU) Code** – A three position code (composed of a two digit subgroup code and a one digit subgroup sequence code) which is assigned to I&S items in order to array the items in ascending order of preference.
- **Alternate NIIN Relationship Code (ANRC)** – A two digit code that indicates the conditions or restrictions under which each alternate item may be used (US Navy Unique).
- **Jump-To-Code (JTC)** – A three digit code used to note an exception to the normal, progressive I&S relationships which pertain to a family group. The presence and value of a JTC identifies items which have no I&S relationship with each other, but do have a common substitute item in the family.

U.S. Navy: Interchangeability & Substitutability

- I&S vs. “Non-I&S”
- The different types of I&S and Non I&S families managed by the DoD are as follows:
 - Fully interchangeable (two-way) families
 - One-way Substitution Families
 - Rework Families
 - Application Control Families
 - Serial Number Control Families
 - Combinations of any of the above family types (excluding Generic Families)

Navy ERP Design

The Supersession Chain was selected because it would support non-fully interchangeable parts and integrated to all of the necessary functions.

I for all fully interchangeable parts in the family
F for all other relationships

OOU was incorporated into the Cause Code

Validity Date was populated to signify order or preference

The Head of Family was populated at the bottom of the SSC so that it would be procured during MRP

Material	Validity Date	Cause	Replacmnt...
014493540			
014493542	02/14/2004	1107	I
014493543	02/14/2005	1110	I
014493544	02/14/2006	1109	I

Required Enhancements

- **Material Requirements Planning**

BADI: MD_ADD_ELEMENTS

used to exclude from the netting process, all elements that are relevant to the non-I&S rework materials in the SSC, as determined by the Cause Code.

- **Jump-to Codes**

No known solution; SAP promises future functionality

Return on Investment

- For the U.S. Navy, \$5.4 billion of annual demand (55%) is for parts that are members of families.
- Automating the process will:
 - Increase customer service levels
 - Better utilize assets to satisfy requirements
 - Elimination of manual processing for filling customer orders therefore dramatically reducing workload for planners

Key Learnings

- Planning for Interchangeability of parts can significantly reduce an organization's inventory procurement spend.
- SAP provides two objects to accommodate interchangeability, FFF Classes and Supersession Chains, each of which function differently and should be used for different circumstances.
- Restricted relationships can not be represented through standard SAP objects.

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