

The Enterprises Web-Portal PECS Product Data Management and Applications

¹X.Charles*, ²Dr.Parta Sarathi Chakraborty

(¹Department of Mechanical Engineering, The Oxford college of Engineering, Bangalore-56, India
Email: charumgr@gmail.com) *

(²Adult and Continuing Education & Extension Department, Jadavpur University, Kolkata-700032, India
Email: p_s_c2001@yahoo.com)

ABSTRACT

Today, a manufacturing engineer's biggest task is to make products within a short span of time while maintaining quality and also with reduced cost. Latest technologies like Product Data Management (PDM) and Product Life Cycle Management (PLM) in web-portal contribute towards the above said task. Product Data Management is a software system that manages the product data and the product development process involved in a particular process. PECS PDM allows the company to securely store, share, modify and tracks their most valuable asset-product content, while stream lining their product development processes. PECS PDM should maximize the time to market benefit of concurrent engineering while maintaining the control of data. It should also distribute data automatically to the people who need it, and whenever they need it. In PECS PDM system, master data is stored in a secured "vault" where its integrity can be assured. They help in instant delivery of information, speeding up tasks. A PECS PDM system allows creation and maintenance of multiple revision and versions of any design in the database.

Keywords – Product Data Management, Product Life cycle Management, Data Management, PECS - Product, Enterprises, Customer and Supply

1.Introduction

The Challenge is to maximize the time-to-market benefits of concurrent engineering [1] while maintaining control of your data and distributing it automatically to the people who need it - when they need it. The way PECS PDM systems cope with this challenge is that master data is held only once in a secure 'vault' where its integrity can be assured and all changes to it monitored, controlled and recorded. Duplicate reference copies of the master data, on the other hand, can be distributed freely, to users in various departments for design, analysis and approval. The new data is then released back into the vault. When a 'change' is made to data, what actually happens is that a

modified copy of the data, signed and dated, is stored in the vault alongside the old data which remains in its original form as permanent record. This is the simple principle behind more advanced PECS PDM systems. To understand it more fully, let us look separately at how these systems [2] control raw product data (fig.1 Data Management and Process Management). As defined by one consulting firm, PECS PDM systems are to... "Organize, access, and control all data related to an enterprises' products and to manage the lifecycle of those products." PECS PDM systems hold master data only once in a secure "vault" Where its integrity can be assured and all changes to it monitored, controlled and recorded. Duplicate reference copies of the master data, on the other hand, can be distributed freely, to

users in various departments for design, analysis and approval. The new data is then released back to the vault. When a “change” is made to data, a modified copy of the data, signed and dated, is stored in the vault alongside the old data which remains in its original form as permanent record. This is the simple principle behind more advanced PECS PDM systems.

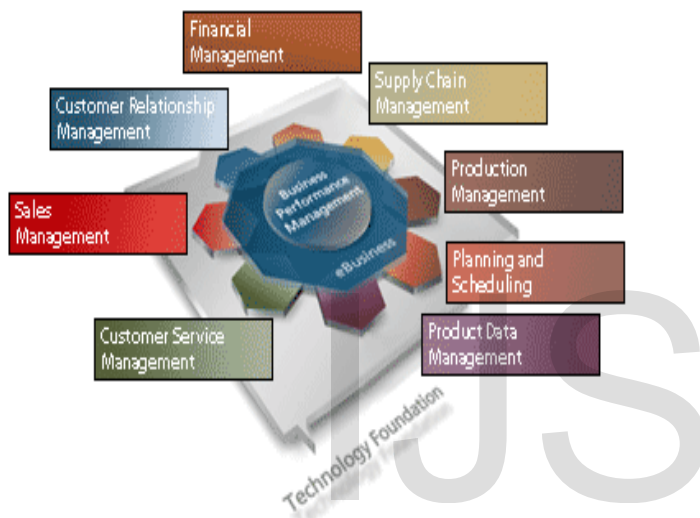


Fig.1 Data Management and Process Management

In this present work Product electronic data/document management, work flow process management, product structure management & Configuration Management, Component & supplier Management and utility functions are described [5].

1.1 Electronic Data/Document Management: Storing large amounts of different types of data, e.g., multiple CAD files, Word Docs, etc., and providing access and security through “vault”.

1.2 Workflow and Process Management: Controls procedures for handling product data and also keeps

track of changes to product data. Provides work break down structures and allows coordination between products related processes, resource rescheduling and project tracking.

1.3 Product Structure Management and Configuration Management: Handles bills of material, product configurations, and associated versions and design variations. One distinct advantage is the ability to hold not just the physical relationships between parts in an assembly but also other kinds of structures; for instance, manufacturing, financial, maintenance or document relationships.

1.4 Component and supplier Management: Parts classification and retrieval – search for standard parts and existing design. A repository of suppliers is also maintained.

1.5 Utility functions: Communication capabilities such as links to e-mail provide for information transfer and events notification. Data transport functions track data locations and move data from one location or application to another. Data translation capabilities exchange files in the proper format. Image services handle storage, access, viewing and mark-up of product information. Administration functions control and monitor system operation and security.

In this PECS PDM product suites typically deliver a portion of the features and functions that might be available from a stand-alone, best of breed component. This limitation is countered by the fact that the component functions offered are integrated “out of the box”, providing a tremendous time and cost savings.

2.Objective:

The objective of this research is to build an intranet application to integrate [3] the heart function of the companies departments. Design, stores, purchase, assembly and manufacturing. And it will deliver the following,

- Delivers relevant information's to all the departments to perform their functionality effectively and quickly from other depts.
- Associative data system
- Effective communication system between departments
- Implements con current engg in the product cycle
- Design conferencing between design and manufacturing depts.
- Product viewer facility etc.,

3. PECS PDM'S evolutionary development:

PECS PDM focused on solving the problems of CAD and related technical document data management by providing a good vaulting function, typically for an engineering department or workgroup. These PECS PDM systems were built upon foundation technologies that handled data and communication requirements. PECS PDM vendors quickly added additional functions to this base, expanding the core data management capabilities.

As the PECS PDM market evolved, its scope expanded beyond basic CAD file management. By the early and mid-1990s, industrial companies required more

sophisticated applications and business functions to support an enterprise's engineering data management requirements, including engineering change control, product structure management, and version control. A host of related technologies, such as visualization and workflow management, began to appear and were quickly used to enhance the capabilities and value of PECS PDM implementations. As the need for data management grew and evolved, so did the terminology used for support. Over the years, PLM has emerged as the common term used to describe the entire area of creation, management, and use of product definition information (i.e., an enterprise's intellectual assets) throughout the entire product lifecycle and extended enterprise.

As PECS PDM's scope has expanded, a greater emphasis on the part of PECS PDM vendors was placed on development and delivery of business solutions. These complete or comprehensive solutions have come to include both products and services, and help the software vendors clearly differentiate their offerings. More importantly, these comprehensive, often preconfigured solutions are designed to simplify the implementation process by their target clients. To accomplish this, vendors have worked to develop specific and complete solutions that address one or more common business problems. Typical PECS PDM-related business solutions include the support of Engineering change management, bill of material management, component and supplier management, supply chain management, quality management,

version control, and many other diverse business initiatives.

In order to provide a comprehensive “solution” to a specific business problem, adapting one’s technology to solve the problem is not sufficient. Total solutions include a combination of the right technology, appropriate processes, implementation tools, “best business problem. Finally, tailored implementation methodologies get the solution into production as quickly as possible. PECS PDM vendors target these business solutions, which are built on top of core PECS PDM functions and applications, at specific industry issues, such as design and product configuration data management within a first- or second-tier automotive supplier. This trend toward providing more focused solutions is excellent for the industry and CIM data expects it to continue. By taking this approach, the solutions become easier for small, medium, and large industrial enterprises to implement and to achieve better results more quickly. This is a key success factor for those vendors who target mid-size manufacturing enterprises that demand complete solutions.

4. General system of PDM:

Stage I: The product design data from the design department [6] gets into a format of design dept BOM, gives the information about the product like the following,

- ❖ Design ID

practices” approaches, focused implementation support, templates, etc. Typically, these solutions are based upon preconfigured and adapted versions of the base solution, with a specific data model, and focused processes, applications, wizards, and reports to ensure that the total technology package is sufficient to meet the targeted

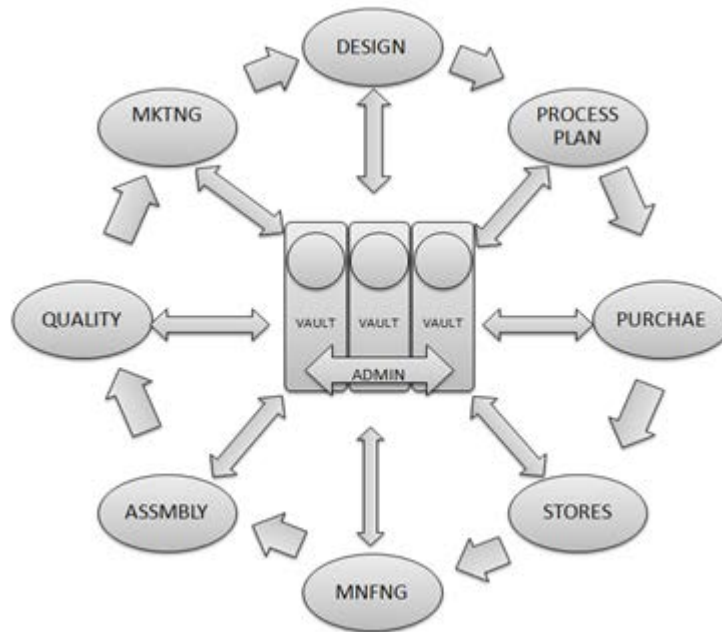
- ❖ Component name
- ❖ Material
- ❖ Quantity and other information’s

Stage II: The data is processed by the stores department they maintain a file for the respective product, it consist the following,

- ❖ Component name
- ❖ Material
- ❖ Quantity
- ❖ Design ID
- ❖ Availability of the component
- ❖ Number of quantity in hand, to be purchased., etc.

Stage III: The data from the design and stores is processed in the purchase dept and they decide what to purchase, where to purchase, whom to order and other details.

Stage IV: The data from the design, stores and purchase are analyzed and processed in the manufacturing dept and manufacturing planning is done before starting the manufacturing. Sub contracting also decided by manufacturing dept.



5. Feasibility study:

In this system influence with Operational, Technical and Economical feasibility studies also described below,

5.1 Operational feasibility: After studying all the user requirements it is possible that the assurance of delivering the PECS PDM system for the company and it is highly beneficial and will meet the operating requirement of the company. The entire key users involved in the each department are familiar with the LAN system and there is no resistance from the user side to implement this PECS PDM system in the company.

5.2 Technical feasibility: All the depts. of the company are PC with windows based. The proposed system will run on internet explorer which already exists in all departments.

5.3 Economical feasibility: The resource required for the development is already equipped in the form of

desktop PC's, LAN connections and internet connections (optional for PECS PDM). The required platform windows'95 (minimum), internet explorer are readily available on these machines. Thus no extra expenditures for hardware and software are involved.

6. SYSTEM DEVELOPMENT – TOOLS

The proposed Web portal PECS PDM system involved following computer based software [4],[7] and modules,

6.1 Software

- ✓ Windows XP
- ✓ VISUAL STUDIO 6.0
- ✓ MS – ACCESS
- ✓ AutoCAD
- ✓ PRO – E
- ✓ UNIGRAPHICS
- ✓ E-DRAWING
- ✓ CO – CREATE DRAFT
- ✓ PRODATPRO

- ✓ ANSYS
- ✓ CRYSTAL REPORT
- ✓ MS – WORD 2003
- ✓ MS – EXCEL 2003

These software and tools can deliver the ultimate goal of Data Management computing, an environment in which components not only inter operate also collaborative at the semantic level to get job done in timely manner. Fig.4 displays different departments must be served for creation of information, controlling and manage the flow of informations. To create and provide the right set of information in secure manner.

7. Module Description

The modules developed in this PECS PDM module are shown in fig.4, 5, 6 as follows,

- Design information system

- Stores information system
- Purchase information system
- Manufacturing information system
- Assembly information system

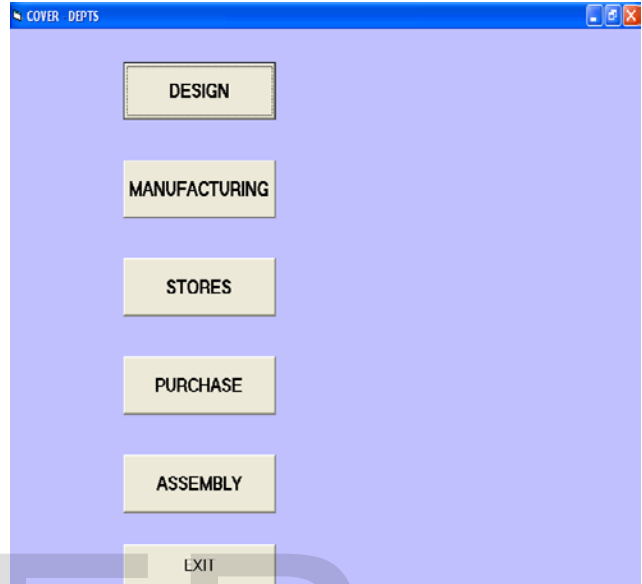


Fig.4. Graphical User Interfaces (GUI) of PECS PDM module.

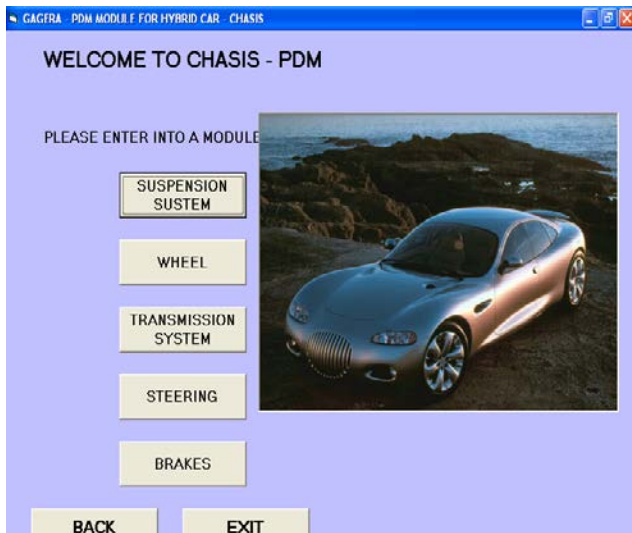


Fig.5 Enter into particular module



Fig.6 Log-in screen of Transmission system

7.1 Fields in each Department Module: Each and every Department of enterprise is involved and displays in PECS

7.1.1 DESIGN Department: In fig.7 displays design department field details creation in design module of PECS system,

- Designer ID
- Designer Name
- Component Name
- Begin Date
- End Date
- Material
- Component ID
- Design Definition
- Checked By

7.1.2 Stores Department: The following Component fields data also can be create in stores department module,

- Stores ID
- Stores status
- Quantity in hand
- Quantity to purchase
- Production quantity
- In charge ID
- In charge name
- Nature of the component
- Component ID
- Material of the component
- Date of arrival
- Date of delivery

7.1.3 Purchase Department: The following fields data also can be create in purchase department module,

- Order number
- Order date
- Quantity to purchase
- Supplier name
- Supplier code
- Supplier phone number
- In charge ID
- In charge name
- Due date
- Date of delivery
- Material
- Purchase status
- Component ID
- Stores ID

7.1.4 Manufacturing Department: Manufacturing of component field data also can be create in manufacturing department module,

- Component Name
- Component ID
- In charge Name
- In charge ID
- Length / Height
- Dia / Width
- Material
- Tooling Status
- Types of Operation
- Machines Used
- Operation Time

- Manufacturing Quantity
- Checked By
- Begin Date
- End Date

The screenshot shows a software interface for data entry. The window title is 'PDM - DESIGN DEPARTMENT - COVER'. The form has the following fields and values:

DESIGNER ID	FRWA01
DESIGNER NAME	RAJA
COMPONENT NAME	PIN (LOCK CLAMP)
BEGIN DATE	1/3/2006
END DATE	5/3/2006
MATERIAL	M.S
COMPONENT ID	PIN45
DESIGN APPLICATION	USED TO HOLD THE LOCK CLAMP
CHECKED BY	RAMA

Buttons on the right: ADD, DELETE, EDIT, SAVE, EXIT. A 'DETAILS' button with navigation arrows is also present.

Fig.7 Field Data creation in Design department module

7.1.5 Assembly Department: The following fields data also can be create in assembly department module,

- Part name
- Part number
- Assembler name
- Assembler ID
- Begin date
- Component 1
- Component 2
- Component 3
- Component 4
- Component 5
- End date
- Cleared by

8. Summary of Product Data Report and Departmental Data:

This PECS PDM tools system must allow to get all reports like product costing report and individual department data base report also as shown in fig.8, fig.9 and fig.10 below.

S.NO	COMPONENT NAME	QUANTITY	COST / COMPONENT	SERVICE TAX	TRAVEL CHARGE	BROKERAGE	TOTAL
1	LOCK CLAMP	10	8/-	3%	70/-	80/-	23
2	PIN	10	3/-	1%	70/-	80/-	18
3	WASHER	10	.50/-	0%	30/-	20/-	55
4	HUB	10	16/-	2%	70/-	80/-	32
5	CUP	60	3/-	0%	30/-	20/-	23
6	SPRING	60	10/-	2%	70/-	50/-	74
7	COVER ASSEMBLY	10	100/-	3%	70/-	80/-	11
8	WASHER	10	1.75/-	0%	30/-	20/-	67
9	DISC CLUTCH	30	400/-	3%	70/-	80/-	12
10	CLUTCH PLATE	30	500/-	3%	70/-	80/-	15
11	CIRCLIP	10	70/-	1%	70/-	80/-	22
12	BEARING BUSH	10	50/-	2%	60/-	30/-	60
13	ENGAGE/DISENGAGE GEAR	10	500/-	3%	70/-	80/-	53
			5000/-				

Fig.8 Product costing report of PDM tool.

Fig.9 Total Database of Product in PDM tool.

STORES ID	STORES	QT	QTY	PRC	INCHAR	INCHAI	NATU	COMPONENT	MATERIAL OF	DATE OF ARRIVAL	DATE OF DEI
FRWAS01	PARTIAL	500	100	350	ST0001	LOGU	RAW	FRWAST01	M.S	04/03/06	06/03/06
FRWAS02	PARTIAL	250	110	180	ST0001	LOGU	RAW	FRWAST02	C.I	04/03/06	06/03/06
FRWAS03	FULL	40	0	35	ST0001	LOGU	RAW	FRWAST03	BRASS	05/03/06	06/03/06
FRWAS04	FULL	20	0	12	ST0001	LOGU	RAW	FRWAST04	ALLOY STEEL	05/03/06	06/03/06
FRWAS05	PARTIAL	15	14	10	ST0001	LOGU	RAW	FRWAST05	M.S	6/3/06	8/3/06

Fig.10. Total Sores Department Database in PDM tool.

9. Conclusion:

The paper concludes with survey of strategies currently being used in the automotive industry for product data retention. In this PDM tool approaches for product data retention were identified along with system advantages and disadvantages for each and every department approaches. The concepts, definitions, components, applicability, features and contents of PECS PDM is approached in detail.. This research is confined of automotive industry of transmission system Datas were collected on hybrid car and integrated as databases and GUI some of the solid modeling software and other software's were linked to prepare a PECS PDM module. Thus more reliable, user friendly PECS PDM module was prepared and implemented in the proposed system which will definitely be useful for all mid markets. In future this module can be further developed as a separate module for other components of the car or for the whole of the same. Solid modeling software's like ANSYS, NASTRAN, SOLID EDGE, CFD and CATIA... can also be linked to this module.

Acknowledgements:

The authors are grateful to and wish to express their constructive valuable comments and suggestions, which help us to improve this research greatly.

References:

[1].Boris Otto, (2012) "Managing the business benefits of product data management: the case of Festo",

Journal of Enterprise Information Management, Vol. 25 Iss: 3, pp.272 – 297.

[2]. Jx Gao, Hayder Aziz, P.G. Maropoulos, W.M. Cheung, Application of product data management technologies for enterprise integration, *International Journal of Computer Integrated Manufacturing*, Vol 16, Iss 7-8, Oct-Dec 2003, Pages 491-500.

[3].Codre, Cristian, Popescu, Sorin and Tifrea, Dorin. 2011a. Enhancing product development through dedicated web applications. *Academic Journal of Manufacturing Engineering*. Timișoara : s.n., 2011a. Vol. 7, 1. ISSN: 1583-7904.

[4].Brethauer, Dale. 2002.*New Product Development and Delivery: Ensuring Successful Products Through Integrated Process Management*. New York : AMACOM - American Management Association, 2002. ISBN: 0-8144-0713-7.

[5]. Codre, Cristian, Popescu, Sorin, Constantinescu, Carmen and Popescu, Daniela. 2010a. PLM as a success factor of sustainable development. *Proceedings of the 1st Management Conference: Twenty Years After - How Management Theory Works*. Cluj-Napoca : Todesco Publishing House, 2010a. Vol. 1, 1. ISBN: 978-973-7695-99-4.

[6].Object Management Group. 2011. Unified Modeling Language. *Object Management Group*. [Online] 2011. [Cited: 15 06 2011.] http://www.omg.org/gettingstarted/what_is_uml.htm[7].

Stark, John. 2007. *Global Product: Strategy, Product Lifecycle Management and the Billion Customer Question*. London : Springer, 2007. ISBN 978-1-84628-914-9.

[8]. Bernard, A., & Tichkiewitch, S. (2008). *Design of Sustainable Product Life Cycles*,Berlin: Springer-Verlag.