International Journal of Advance Research in Science and Engineering
Vol. No.6, Issue No. 04, April 2017
www.ijarse.com
IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

PRODUCT LIFE CYCLE MANAGEMENT OF SPIN-TUB. "CASE STUDT"

Shubham A. Hatware[1], Suraj M. Thengane[2]

Firoz I. Mirza[3], Khulesh B. Meshram[4], Kajal B. Peddey[5]

[1]*Mechanical Engineering, Babasaheb Naik College of Engineering, pusad (India)*

ABSTRACT

The Product Life Cycle (PLC) concept is a well-known marketing strategy and planning tool. The concept is based on a simple biological analogy of stages over a product's "life," which is intuitively appealing, but unfortunately has limited utility in practice. For such a prominent marketing tool, the lack of both a focus on consumers and a theoretical basis is surprising. Diffusion of innovation models and theory offer considerable promise to provide a theoretical basis for the PLC. To date, diffusion models have been limited to explaining and forecasting PLC sales patterns.. However, even if a company actually wishes innovate its processes for improving the way to account for project management, it will face relevant difficulties to deal with different guidelines, tools and methods currently addressing the matter from various points of view. The purpose of this project is to review literature on PLM from an operational point of view with the objective to help companies to answer to the main market needs.

I.INTRODUCTION

The PLM concept links different stages of product development (Computer Aided Engineering (CAE), Computer Aided Design (CAD), Product Data Management (PDM), Manufacturing Process Management (MPM), Enterprise Resources Planning (ERP), etc., in a unique numerical chain. The target is to better answer the questions of time-to-market, cost, and quality criterions. In fact, there is no unique tool or method which allows managing project for the development of a product. It is very difficult because of the vast amount of information which comes from different trades.

Product lifecycle management (PLM) concerns the management of lifecycle data – data associated with an actual instance of a product that records an account of its development, deployment, operation, maintenance, and disposal. However, these challenges have existed for several years, and for the most part, PLM is a perspective on the general problem rather than a specific solution. In PLM the technical data are organized within configurations. The configuration management is used to manage products complexity and knowledge diversity resulting from various business cases in the company.

II.PHASES OF PRODUCT LIFE CYCLE

2.1 The Span Of Product Life Cycle

In respect to any product or service, its life cycle can be short if it is for instance a souvenir of the 2010 World. Exposition Shanghai but it may be quite long, say a brand of motorcar. Even an ephemeral product, however, goes through the several phases in its life cycle as a long-lasting one does, which are characteristic of returns that the product brings from the sales.

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

2.2 Illustration of The Phases

In most researches the product life cycle are divided into four stages shown by the following chart.

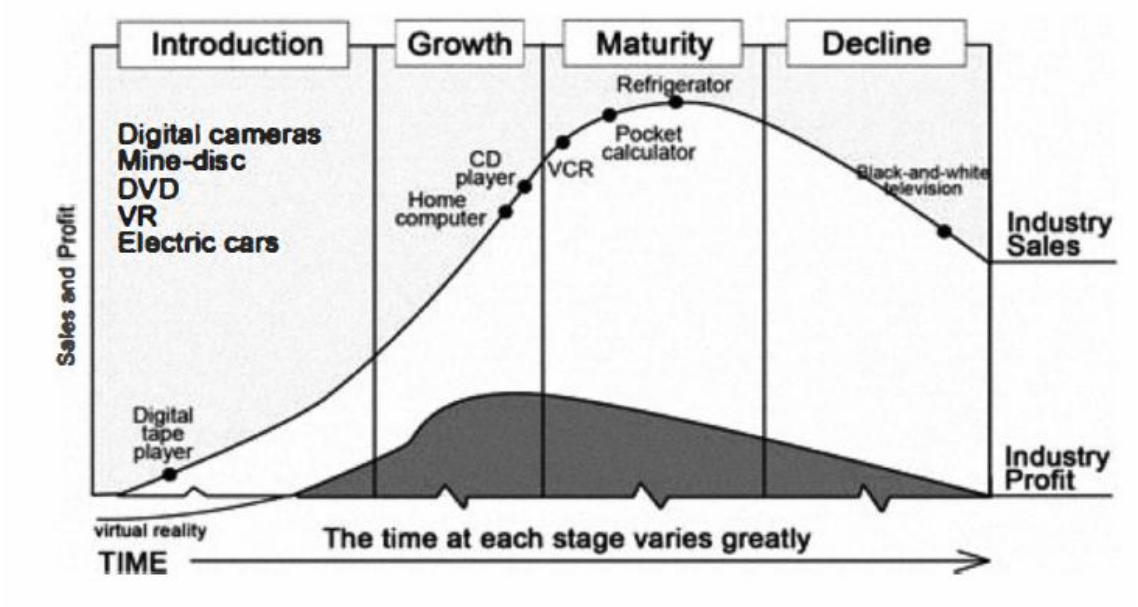

Fig.3.3.2 : Product life cycle Model

2.2.1 Introduction Phase

This is the phase when the product is launched into the market. It is the key phase, deciding whether the project of a new product is a success or a failure but it is a sinkhole of money. The company has to invest quantities of money in promotion and advertisements to arouse the public awareness of the advantages of the product. In 359 spite of the enormous expenditure and even though there are no or few competitors, the profitability may be null if not negative, for it is quite possible that only a small amount of innovators are willing to pay for a try of a novel object. At this stage, the pricing policy and promotion strategies and methodologies are crucial. It would be inspiring to have the product seen on every counter, which, though, is next to impossibility. Many companies would like to prefer engaging external contractors or outsourcing.

2.2.2 Growth Phase

As the term suggests, now sales and profits grow rapidly. If the product is a new invention, a unique one in the market, it stands advantageous and enjoys a satisfactory market share. Now advertisements and promotion are still required but to a less extent than before. This monopoly will not last long; some other companies will sure follow suit and manufacture similar or the same product. The company then has to offer improved versions of the product and better after-sale services to vie with the competitors in order to keep up and enlarge its market share. To achieve the end, most companies, through acquisition of licenses and copyrights, build barriers keeping the likely competitors from copying the product.

2.2.3Maturity Phase

Take the refrigerator for example. In China it is nowin the maturity stage, which is characterized by market saturation with various brands and models of refrigerators available on the market. When a refrigerator manufacturer seeks to increase its market share, its competitors must suffer losses as the market as a whole cannot become any larger in this phase. Competition is fierce. Those that have gained an advantageous position

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

in the market are having a staggering yield while those that fall behind had better veer their business. The largest profits are now gained as against other phases. This phase is a good time to lengthen the product life by, for example, throwing out new brands, though they may present a challenge to the existing ones, part of which will have to become superseded. Improvement on the distribution systems, too, is necessarily made to draw new consumers. A successful sale strategy may "rejuvenate" an old product, rendering it a long life.

2.2.4Decline Phase

When the sales of a product are definitely foreseen to dwindle evidently, it is time to withdraw it from the market. Withdrawal does not mean simply stopping production. There are a large number of problems to solve when it is decided to pull out the product from the market, for example, maintenance and spare part availability of the product to be withdrawn, and retention of the loyal customers.

III. OPERATIONAL AREAS FOR IMPLEMENTATION OF PLM

PLM implementation is planned to improve product development performance, here are the six operational areas where one has to manage.

[1.] Targeting the right value opportunity -Ensuring that the program will deliver long-term value to the corporation.

[2.] Applying a methodical implementation approach- ensuring that the implementation follows a proven cycle of design, development, and deployment.

[3.] Tight scoping with effective change control –A formalized process and structure for managing changes to the scope of the program.

[4.] Ensuring end-user adoption - Linking the daily activities of end-users to the value opportunity.

[5.] Creating a contract for success -Making sure that the mechanics of the written contract reflect the expected value

[6.] Strong program governance -A formalized process and structure for decision-making and setting of priorities.

IV. CASE STUDY

4.1 Companyinformation

Ekdant Moulders and Engineering Private Limited

Ekdant Moulders and Engineering Private Limited was registered on 18 August, 2003. Ekdant Moulders and Engineering Private Limited's Corporate Identification Number (CIN) isU25209MH2003PTC141787, Registration Number is 141787.

Ekdant Moulders and EngineeringPrivate Limited currently has 2 Directors / Partners: **Kamalkishor Narayandas Laddha, Narendra Uttamchand Khivansara**, and there are no other director / partners in the company except these 2 officials.

International Journal of Advance Research in Science and Engineering
Vol. No.6, Issue No. 04, April 2017
www.ijarse.com
IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

Table: 4.1.1

COMPANY INFORMATION

Corporate Identification Number	**U25209MH2003PTC141787**
Name	EKDANT MOULDERS AND ENGINEERS PRIVATE LIMITED
ROC	ROC-Mumbai
Registration Number	141787
Company Category	Company limited by shares
Company Sub Category	Indian Non-Government Company
Class of Company	Private Company
Authorized Capital (in Rs.)	75,00,000
Paid up capital (in Rs.)	75,00,000
Number of Members(Applicable only in case of company without Share Capital)	0
Date of Incorporation	18 August 2003
Address 1	Gat No 25, Paithan Road
Address 2	Chitegaon
City	Aurangabad
State	Maharashtra
Country	India
Pin	431107
Whether listed or not	Unlisted
Date of Last AGM	18 August 2013
Date of Balance sheet	31 March 2016
Company Status (for eFiling)	Active

4.4 Part Name:- Spin Tub

Spin Tub is one of the parts that manufacture inEKDANT MOULDERS AND ENGINEERING PVT.LTD., CHITEGAON, AURANGABAD. It has part no: 19 and is used in Videocon Washing Machine. It is mounted on the left hand side of the washing machine. It is use to shower water on your clothes and also use to dry the clothes.

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

4.5 Part Lists

There are 92 parts manufacture by EKDANT MOULDERS AND ENGINEERING PVT.LTD.This industry supplies 15 parts to LAMBODHAR INDUSTRIES PVT. LTD. 20parts to TATA GROUPS PVT. LTD.and 57 parts to VIDEOCON PVT. LTD.From that we selected the part SPIN TUB for case study of Product lifecycle management. SPIN TUB having a no. 19 and it provides to Videocon Company for washing machine.

V. DEVELOPMENTS

System development,System of defined steps and tasks such as strategy, organization, concept generation, marketing plan creation, evaluation, and commercialization of a new product. It is a cycle by means of which an innovative firm routinely converts ideas into commercially viable goods or services.

There are various processes involved in the development of product- The list is given in the below:

- Collect the drawing
- Study the drawing
- Decide the process of tooling
- Manufacturing comment
- Verify the manufacturing comment
- Modify the drawing as per manufacturing comment
- Select tool room for quotation
- Distribute drawing tool room
- Tool room comment
- Collect quotation, design and time plan.
- Finalized quotation, design and time plan
- Issue the purchase order to tool room
- Work on prototype sample on forming tool
- Collect wire cut 5 sample for SIR (Sample Inspection Report)
- Verified as per drawing to our end
- Verified as per drawing to customer end
- Vehicle trial at BAL if required modification the drawing as per fitment
- Customer remark on SIR
- If ok SIR process final tooling
- If not ok SIR repeat sample after correction
- Decide 1 pilot lot and trial of all tools at our end
- Development review chart submission
- PDI of pilot lot and dispatched to customer end.

International Journal of Advance Research in Science and Engineering
Vol. No.6, Issue No. 04, April 2017
www.ijarse.com
IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

VI. MANUFACTURING PROCEDURE OF SPIN-TUB

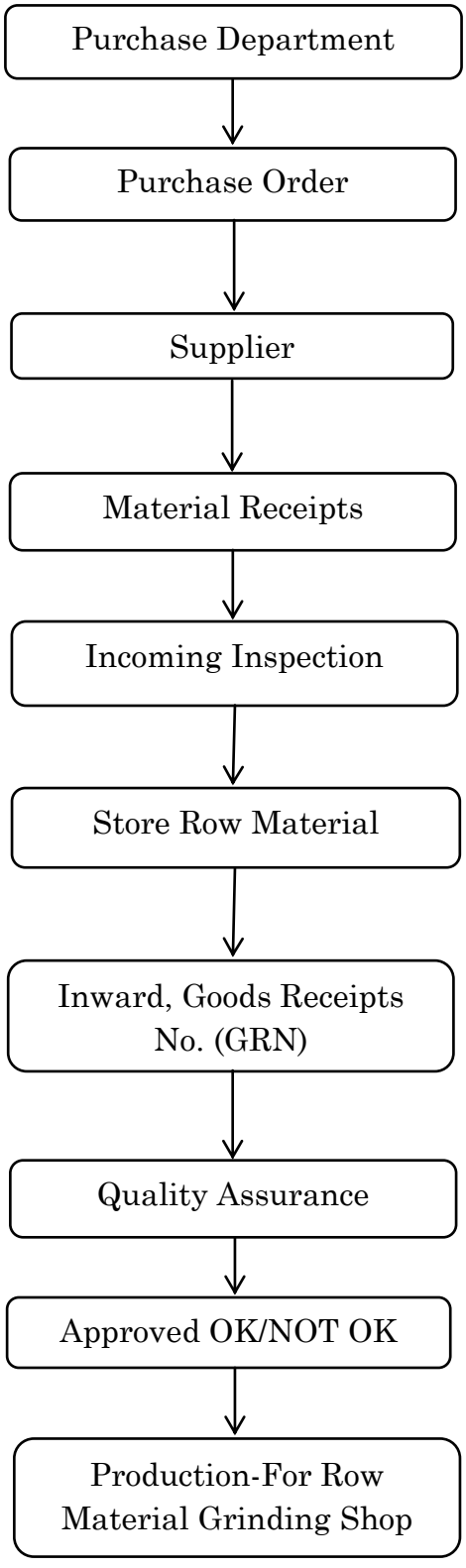

Fig.6.1 : Manufacturing Procedure of SPIN-TUB

International Journal of Advance Research in Science and Engineering
Vol. No.6, Issue No. 04, April 2017
www.ijarse.com
IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

VII. MANUFACTURING PROCESSES OF SPIN-TUB COMPONENT'S

7.1 Pre-Heating

Preheating is the process in which the ABS material is heated for 2-3hrs at 70-80˚C to evaporate moisture from the material. Thermoplastic material which is in granular in form is use as a raw material. For making granules of plastic wiredrawing method is taken place so the granules of plastic contains moisture which affects the finish product by marking some spots or bubbles in the product. To avoid this, granules of thermoplastic material is preheated in hopper of machine itself.

Fig.7.1:Thermoplastic

7.2 BARREL

Barrel is the horizontal member of injection moulding machine. Two main components of EXTRUDER is barrel and screw. The main function of barrel is to heat the polymer and convert into molten state. Internal
Diameter of barrel typically ranges from 25 to 150 mm and L/D ratio ranges from10 to 30.
For thermoplastic higher L/D ratio is use. Screw is the main component and the rotating member of barrel. The screw performs three functions and is divided into sections:

7.2.1 Feed Section

Stock is moved from the hopper port and is preheated.

7.2.2 Compression section

Polymer is transformed into liquid consistency, airentrapped amongst the pallets is extracted from the melt, and the material iscompressed

7.2.3 Metering section

Melt is homogenized and sufficient pressure is developedto pump it through die opening. Heating coils are use to heat the polymer to convert it into molten state for our product Spin Tub we take the temp. for various zone are 205,215,215,210&200˚C resp.

International Journal of Advance Research in Science and Engineering
Vol. No.6, Issue No. 04, April 2017
www.ijarse.com
IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

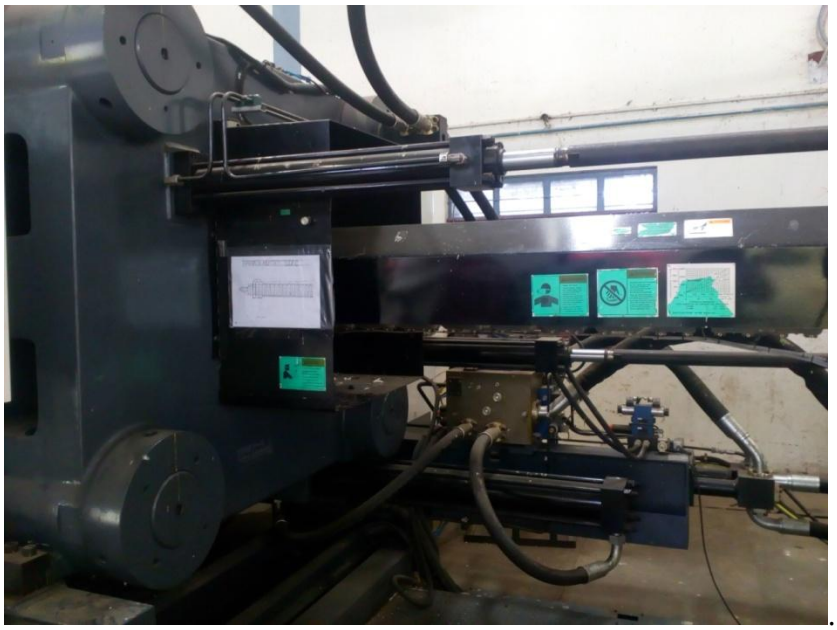

Fig.7.2: Barrel

7.3 Runner

It is the part of machine through which molten plastic is injected in the mould.

There are 2 types of method use in the injection of molten plastic in mould, they are as follows:

1) Cold Runner
2) Hot Runner

For our product Spin Tub we use Hot Runner Process.

A hot runner system having a hot runner tube extending between a sprue bushing and a nozzle fitting which directs plastic into the mold cavity. The tube is slides at each end in closely fitting bores in the sprue bushing and nozzle fitting, so that heat expansion of the tube will not push on and tile the nozzle fitting. In another embodiment, the hot runner tube conducts plastic directly into a gate leading into a mold cavity. The tube has a tip extending into the gate, and the tube can he slid back and forth to control the flow area of the gate.

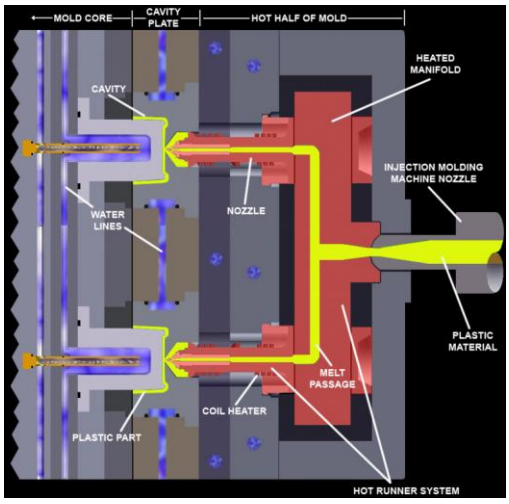

Fig. 7.3: Hot Runner System

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

7.4 Plastic Injection Moulding Machine

The machine is Semi-Automatic. It works on hydraulic. Different sensors are use for the operation purpose such as Proxy sensors for motion, tactile sensors etc. machine ranging from 350tonns- 1350tonns depending upon type of product to be manufacture. For our product we use 650tonn machine.

Some information about Plastic Injection Moulding Machine use for Spin Tub.

Fig. 7.4: Plastic Injection Moulding Machine

VIII. FINAL PRODUCT

Fig 8.1. : Spin-Tub

XI. SUGGESTIONS GIVEN TO THE COMPANY

1. Temp. of barrel at 4^{th} & 5^{th} phase is upto 200^0C but if there will be temp. about 140-150^0C then it will be helpful in low consumption of electricity and the quality of the mould will remain the same as earlier.
2. By providing insulation to barrel (made up of silicon and cotton), the heat transfer rate will be decrease.
3. By reducing the temp. at 4^{th} & 5^{th} phase we can reduce the cycle time of product.

X. ENERGY SAVING

10.1 Calculation

No. of machines available in machine shop

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

Capacity (Tonn)	No. of machines
350	5
500	10
650	20
950	11
1350	4

For production of Spin-Tub 650 Tonn machine is required.

For 1 machine power req. per hr. = 8.2 KW/hr

After Providing Insulation to 1 machine

Power req. per hr. = 7.9 KW/hr

Power saved/hr = 8.2-7.9

= 0.3 KW/hr

For 20 machine = 0.3*20

= 6 KW/hr

For 24 hrs in a day = 6*24

Power saved = 144 KW/hr

For 21 days in a month = 144*21

Power saved = 3024 KW/hr

For 1 year = 3024*12

= 36288 KW/yr

Money saved for 20 machines = 36288*8

For 1 year = Rs.290304

Cost of insulating Material

Cost of silicon per meter= Rs.400

Cost of Cotton per kg = Rs.44

For 8 kg Cotton = 44*8 = Rs.352

Surface Area of Barrel = 2*Π*R*L

Where,

R= Radius of barrel

L = Length of barrel

Area = 2* Π*0.125*3

= 2.35m^2

Cost of silicon for 2.35 m^2= 2.35*400

= Rs. 940

Total cost for 1 machine = 940+352

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

= Rs.1292

For 20 machines = 1292*20

= Rs.25850

Net profit = 290304-25850

= Rs.264454

4. Using water chiller (reverse osmosis) for rapid cooling purpose of the mould output product.

CALCULATION :-

Time req. without Chiller = 10000*2.16 = 21600 min

Time req. using Chiller = 10000*2 = 20000 min

Time Saved = 21600-20000

= 1600 min

By using CHILLER time req. is 2 min so,

Product made in remaining time = 1600/2

= 800 product

Saving per month for 1 machine= no. of product * profit

= 800*15

= Rs.12000

1 CHILLER being use for 5 machines

Saving per month for 5 machines = 12000*5

= Rs.60000

Payback period = total investment / saving per month

= 1000000/60000

= 1.6 yrs.

Compound interest (A) = $P*(1+r/100)^n$

= $1000000*(1+12/100)^{1.6}$

= Rs.198805

Installation cost = Rs.60000

Maintenance cost per yr. = Rs.6000

Electricity consumption for single shift (8 hrs.) = 5 units

For 1 day (3 shift) = 15 unit

Cost of electricity for 1 day = 15*8

= Rs.120

For 21 days in a month = 120*21

= Rs.2520

For 1.6 yrs = 2520*18

= Rs.45360

10.2 Power consumption by the original motor

Power req. for single shift (8 hrs.)= 0.5 unit

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

For 5 machines = 0.5*5

= 2.5 units

Cost req. for 1.6 yrs = Rs. 22680

Electricity Cost = 45360-22680

= Rs. 22680

Total Cost = 1000000+198805+60000+6000+22680

= Rs.1287485

Payback period req. = 1287485/60000

= 1.10 yrs

≈ 2 yrs.

Life of CHILLER = 12-15 yrs

So, it is advisable to plant the CHILLER in the industry.

5. By using pick and place robot (Cartesian robot) we can reduce the output time of the product removal for the machine which helps in increasing the productions as compare to manual operator.

10. CONCLUSION

The Product Lifecycle Management case study on the "Spin Tub" has been carried out successfully and the various processes have been studied in that. PLM has a wide scope in terms of applicability across industries. PLM is not technology but a business approach and encompasses all the technologies PPM, PD, MPM, PDM, etc. PLM doesn't just have the potential to solve the problems in the product lifecycle and in new product development, but also to seize the many market opportunities for new products in the early 21st century. Now PLM is here, allowing companies to develop and support better services and products across the life cycle.

REFERENCES

[1] ValentinaGecevska, Paolo Chiabert, ZoranAnisic, "Product lifecycle management through innovative and competitive business environment", Journal of Industrial Engineering and Management, pp.323-336, October 2010.

[2] ValentinaGecevska,IvicaVeza,ZoranAnisic, "Lean PLM - Information Technology Strategy for Innovative and Sustainable Business Environment",International Journal of Industrial Engineering and Management (IJIEM), Vol.3 No 1, Month 2012, pp. 15-23

[3] Jun-yu YANG, Wei ZHAO, "Pointsworth Re-Consideration Concerning Product Life Cycle Management", IEEE 2010, pp.357-361.

[4] FarhadAmeri and DebaDutta, "Lifecycle Management: Closing the Knowledge Loops",Computer-Aided Design & Applications, Vol. 2, No. 5, 2005, pp 577-590.

[5] FredericDanesi, Nicolas Gardan, YvonnGardan, Michael Reimeringer, "PLM: A methodology for product lifecycle management", Elsvier,Volume 8 August 2007,pp. 304–317.

[6] VirginieFortineau, Thomas Paviot, Samir Lamouri, "Federative approach of interoperability at the design /manufacturing interface using ontologies", 2011 Doctoral Spring Workshop,18 Jun 2012, pp.1-5.

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

[7] Peter Denno,ThomasThurman, "Requirements on Information Technology for Product Lifecycle Management", National Institute of Standards and Technology, Gaithersburg, Maryland, USA, 2005, pp.1-16.

[8] Ravi M. Rangan, Steve M. Rohde,RussellPeak, "Streamlining Product Lifecycle Processes: A Survey of Product Lifecycle Management Implementations, Directions, and Challenges",Journal of Computing and Information Science in Engineering by ASME, September 2005, Vol. 5, pp.229-237.

[9] Shichang Du, Lifeng Xi, Jun Ni, "Product lifecycle-oriented quality and productivity improvement based on stream of variation methodology", ELSVIER, 2008, pp. 180–192.