

Execution of Reverse engineering- an ecologically responsive attitude smeared in OEM plants-Case Study

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Abstract

Regular and financial staples yield significant impressions on Reverse engineering/ re-engineering, replication to form one of the sprouting fundamentals of admissible supply chain. Reverse Logistics is a trick- unwavering directorial inventiveness, basically reexamine and restructuring corporate exercise with the objective of concluding realistic phase forward in quality, receptivity, outflow, customer gladness and additional eve re sequential performance measures.(Dr dale S. Rogers) .This economic contributing an assessment of reverse engineering dream focusing upon the usage of informational modus operandi to provide a passage gone from linear sequential effort relationship towards parallel work and multidisciplinary team exertion.

Keywords: reverse engineering, structure of Effort, outcomes & supposition, product development cycles.

Reverse Engineering: - It's a rapidly developing discipline, wraps a giant number of movements. Though conventional engineering translates engineering concepts and replicas into real modules, but in reverse engineering real parts are renovated into engineering models and concepts, benefited to the wide ranging use of CAD/CAM systems need not to be restated now.(Mark.M-1994) The term BPR (Business Process Reengineering) first defined by Michael Hammer in his seminal article "Re-engineering work":-Don't automate, obliterate,' which appeared in 1990 in Harvard Business Review (Hammer-1990).

Discussion about BPR

□ Process is a structured, measured set of activities designed to produce a specified output for a particular customer or market. It implies a strong emphasis on how work is done within an organization. "(Davenport 1993).

Constituents:

1. Restructuring the Responsibilities:

Association of minor course, sub-tasks and sub-activities into greater, incorporated units and packages. The management should lessen the number of parts, components, sections and ingredients in products and procedures as well as shrink the figure of parts in products and processes. (Gonzalez-Torre-2004)

2. Restructuring the Workforce:

Allow the employees to accomplish and synchronize greater rather than slighter shares of the procedure. (Korpela 2001).

The administration should embolden multi functionality, job rotation, de-specialization and integrated process design.(Fieldman-1998)

3. Restructuring the knowledge:

Knowledge is the capability to synchronize one's activities purposefully one is specialized, atomized and reduce to a machine appendage one cannot coordinate action, but only perform solitary simple and commands. There is need for an incorporated rather than focused learning.(Chouinard- 2005)

Empower the People



Deliver Information



Offer Tools



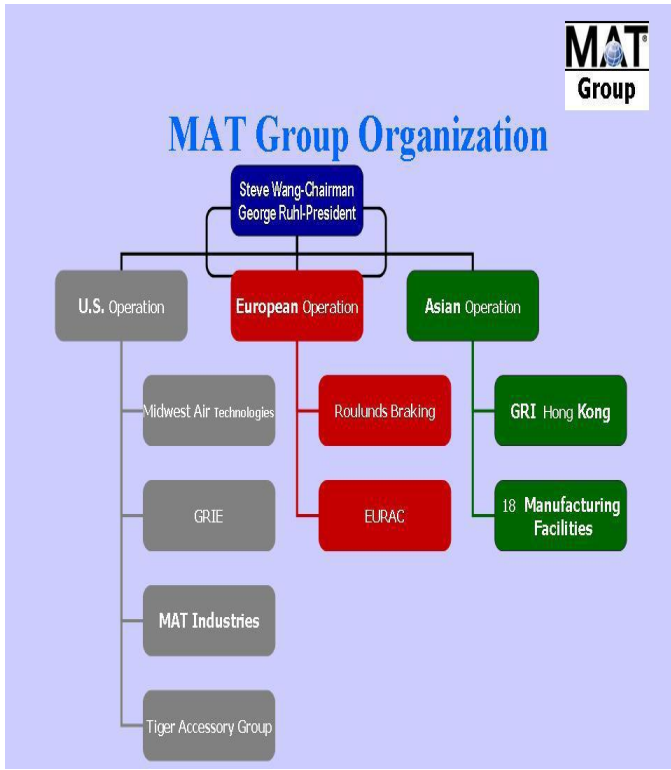
Offer Training



Eradicating Non Value Added Activities

Company Profile of RBI:-Roulunds Braking India (RBI) Pvt. Ltd. is leading manufacturer of Disc Brakes Pads in India, is known for Global quality Asbestos free passenger vehicles Disc brake pads, started its production recently in 1998 under name Hilton Roulunds (India) later changed to Roulunds Braking (India) and have state of the art manufacturing facility at Sonapat in state of Haryana. The company is continuously supplying its friction material to highly competitive European Market / USA Market or we can say that company is 100% export oriented unit. The company products are well accepted in the global market because of its quality, competitiveness and delivery commitment. The company is a wholly owned subsidiary of MAT (Midwest-Air Technologies), based at USA, MAT is Investment Company. The company total manpower is 1200 and turnover is 220 Billion USD P.A. RBI uses purely asbestos free technology for friction lining materials. It comprises the

huge utilization of Hydraulic as well as Mechanical Presses for production.



Product Development Cycle

- STEP I: BACKPLATE INCOMING
- STEP II: POWDER MIXING
- STEP III: COMPRESSION & MOULDING
- STEP IV: HYDRAULIC PRESSING
- STEP V: CURING & POWDER COATING
- STEP VI: GRINDING & FINISHING
- STEP VII: SHIM FITMENT, PRESSING& RIVETTING
- FINAL PRODUCT



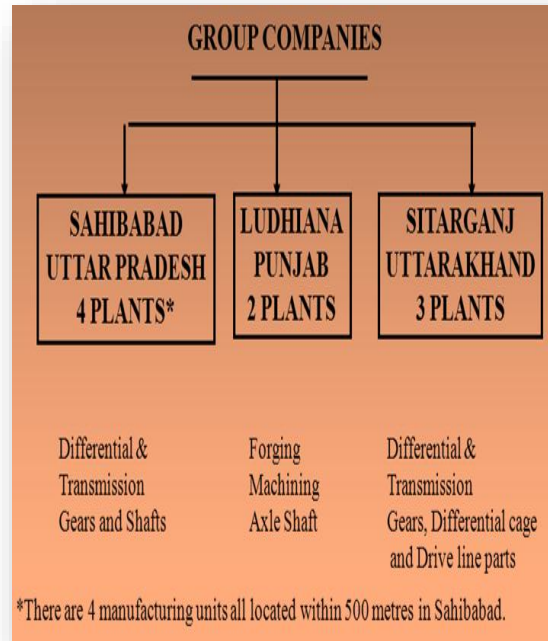
RBI Customers-

- *GENERAL MOTORS * BOSCH *MOTERIO
- *DELPHI *LAND ROVER *TATA *AFFINIA
- *ACDELCO *BAER *RBX *SUZUKI *SAAB
- *FORD *EUROBRAKE *VOLVO

Company profile of PBG:- Punjab Bevel Gears Ltd. started operations in 1979, manufactures more than 2000 different type of gears. Leading manufacturer, supplier and exporter of automotive and tractor parts. Caters to industries like commercial vehicles, agricultural tractors, passenger cars, three wheelers & construction equipment's. Financially sound having credit rating of 'care BBB-' (Triple B Minus) for long term bank facilities for 2014.

- **Group Turnover–Rupees 300 Million**
- **An ISO/TS 16940;:2009 certified company**

PUNJAB BEVEL GEARS Ltd.



Product Range:-

Crown Wheel & Pinion □ Face Hob in both Dry and Wet cutting □ ST. Bevel Gear & Pinion, Transmission Gears (Spur, Helical) Differential Cages Axle Shafts, Forgings/Machined, Forgings Drive Line Parts

PDC: -

- STEP I: Forging (Hammer Process)
- STEP II: Machining
- STEP III: Blank Inspection
- STEP IV: Teeth cutting (Hobbing)
- STEP V: Teeth Finishing (Shaving)

- STEP VI: Drilling
- STEP VII: Milling
- STEP VIII: Chamfering
- STEP IX: Gear Honing
- STEP X: Heat Treatment
- STEPXI: Carburizing(LPG & Methanol)
- STEP XII: Press Quenching
- STEP XIII: Tempering

FINAL PRODUCT



Problems identified in RBI solely responsible for rejections:

| S.N. | Complaints | Process | Problems to blame Rejection |
|------|-----------------------------------|---------------|--|
| 1 | Spots | Pressing | Foreign Material Entrapping, under layer creation |
| 2 | Broken edges | | incorrect recipe selection |
| 3 | Porosity | | Less weight of powder mix & inadequate temp. |
| 4 | Cracks | | Unclear groove & inadequate cleaning |
| 5 | Cake /friction shifting | | Undercutting and looseness of guide pins |
| 6 | Curved Pad | | Overheated press |
| 7 | Dent on back plate | | Excess pressure generation on pads |
| 8 | Flashes | | Tool wear out |
| 9 | Counter Thickness | Powder Mixing | incorrect balancing of powder & operator negligence |
| 10 | Unclear gap between layers | | inadequate mixing of powder |
| 11 | Green/Rusted Pads | Curing | Moisture presence at plate surface |
| 12 | Pressure Drop page | Grinding | Failure of pressure pump |
| 13 | Low thickness | | inadequate recipe selection |
| 14 | Gap creation between plate & shim | Shim Fitment | inadequate cleaning of pads & poor quality material used |
| 15 | Back plate failure | Assembly | Over/under sizing of tool |
| 16 | Clip Damage | | Exertion of excess pressure on rivets |

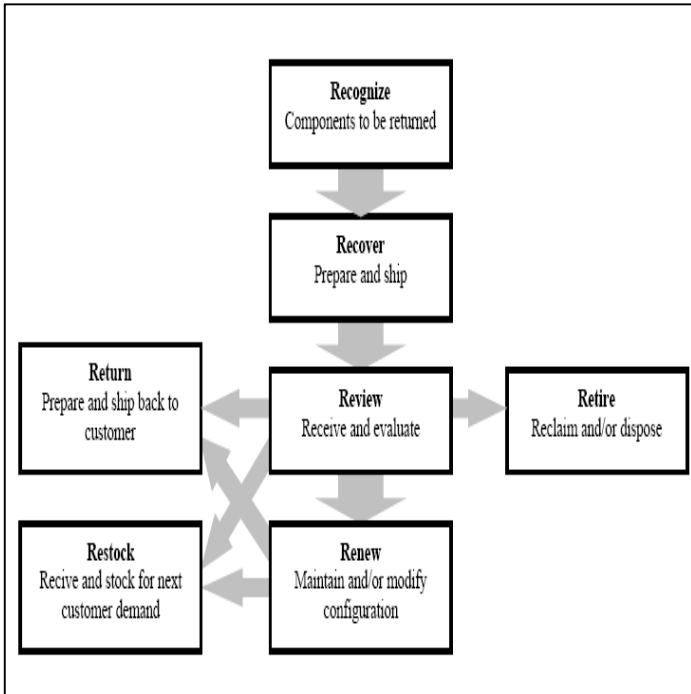
Problems identified in PBGL solely responsible for rejections:

| S.N. | Part Name | Complaints | Process | Problems to blame Rejection |
|------|---|------------------------------------|----------------|---|
| 1 | Crown wheel & Pinion | Flakes | Forging | These are basically internal rupture caused by the improper cooling |
| 2 | Pinion Epicycle Tafe | Scaling | | Improper cleaning of the stock used for forging |
| 3 | Gear 3ITI 15T18S prner | Fold | | When two surface of the metal fold against each other without fusing property |
| 4 | Steel Plate Output Flange | Cracks | | Due to excessive cold working |
| 5 | C2 | Lug band | Transportation | 100% inspection is going on at forging state |
| 6 | High / low speed gear | DOP/MOT/tooth width under/oversize | Teeth Cutting | Setting not done properly |
| 7 | Constant mesh gear | PCD Run out | | Cutter/fixture/center out |
| 8 | Pinion 3 rd and reverse gear | Full depth under/oversize | | Setting not done properly |
| 9 | Sun gear rear axle shaft | Cutter/pitting marks | | Cutter teeth broken |
| 10 | Shifting gear | Lead out | | Setting not done properly |
| 11 | Hydraulic pump idle gear | Keyway upset | | Setting not done properly |
| 12 | Shaft P.T.O Drive | Dent/Damage | | Due to material handling |

Methodology Implemented in RBI and PBGL :-

The time producers require producing products which are easy for dismantling, reprocess, recycle and reproducing paid to the law of environmental protection. On the other side no of users helping culture protection by delivering their used products to collection centers is increasing. [1]. According to the survey, the total cost

occurred in RSCM is very huge amount and to reduce it, high utilization of collection centers, selection of appropriate location are critical issues. According to the findings of Rogers & Tibben Lembke (1998) the total logistic cost amounted is \$862 billion in 1997 and total cost spent in RSCM is \$35 billion which is 4% of total logistic cost.



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|----|-----------------------------------|---------------|--|--|
| 8 | Flashes | | Tool wear out | confirm regularly checking of tool tip and provision for heat dissipation |
| 9 | Counter Thickness | Powder Mixing | incorrect balancing of powder & operator negligence | Timely checking of balance & employed single man for balancing only |
| 10 | Unclear gap between layers | | inadequate mixing of powder | Displayed exact proportionate of powder for different recipes |
| 11 | Green/Rusted Pads | Curing | Moisture presence at plate surface | Confirm proper checking of all parameters like pressure, temp, coolant etc. of process |
| 12 | Pressure Drop page | Grinding | Failure of pressure pump | Provided checklist for pump checking before each operation |
| 13 | Low thickness | | inadequate recipe selection | Provided training to operators about all parameters |
| 14 | Gap creation between plate & shim | Shim Fitment | inadequate cleaning of pads & poor quality material used | Assurance of proper cleaning and materials of good quality |
| 15 | Back plate failure | Assembly | Over/under sizing of tool | Confirm physically checking of tool after each stroke |
| 16 | Clip Damage | | Exertion of excess pressure on rivets | Sufficient pressure assurance during each fitting by gauges |

Problems identified in RBI solely responsible for rejections enlisted with provided solutions:-

| S.N. | Complaints | Process | Problems to blame Rejection | Developments |
|------|-------------------------|----------|---|--|
| 1 | Spots | Pressing | Foreign Material Entrapping, under layer creation | Cleaning of edges of molds regularly |
| 2 | Broken edges | | incorrect recipe selection | Proper training to operators before operation |
| 3 | Porosity | | Less weight of powder mix & inadequate temp. | confirm accurate calibration of balance |
| 4 | Cracks | | Unclear groove & inadequate cleaning | confirm sufficient cleaning of groove |
| 5 | Cake /friction shifting | | Undercutting and looseness of guide pins | Provided attachment for enough tighten of pins |
| 6 | Curved Pad | | Overheated press | Coolant media is provided during operation |
| 7 | Dent on back plate | | Excess pressure generation on pads | confirm proper working of pressure gauge |

Problems identified in RBI solely responsible for rejections enlisted with provided solutions:-

| S.N. | Part Name | Objections | Process | Counter Measures | Developments |
|------|---------------------------|------------|---------|---|--|
| 1 | Crown wheel & Pinion | Flakes | Forging | These are basically internal rupture caused by the improper cooling | This can be remedied by flowing proper cooling process |
| 2 | Pinion Epicycle Tafe | Scaling | | Improper cleaning of the stock used for forging | By the proper cooling of the stacks |
| 3 | Gear 3ITI 15T18Sp rner | Fold | | When two surface of the metal fold against each other without fusing property | By the proper fusing process |
| 4 | Steel Plate Output Flange | Cracks | | Due to excessive cold working | By follow proper cooling process |

| | | | | | |
|----|---|-------------------------------------|----------------|--|--|
| 5 | C2 | Lug band | Transportation | 100% inspection is going on at forging state | Material handling should be reduced and robotics are essential |
| 6 | High / low speed gear | DOP/MOT/ tooth width under/oversize | Teeth Cutting | Setting not done properly | Adjust mechanical/limit stopper |
| 7 | Constant mesh gear | PCD Run out | | Cutter/fixture/center out | Re dialing and true with in 10 microns |
| 8 | Pinion 3 rd and reverse gear | Full depth under/oversize | | Setting not done properly | Adjust slide and limit stopper |
| 9 | Sun gear rear axle shaft | Cutter/pitting marks | | Cutter teeth broken | Slow the feed/cutter change |
| 10 | Shifting gear | Lead out | | Setting not done properly | Re dialing the cutter and true within 10 microns, adjust the cutter angle , realign the job centre to centre |
| 11 | Hydraulic pump idle gear | Keyway upset | | Setting not done properly | Align the job centre to centre, Adjust slide towards centre to centre |
| 12 | Shaft P.T.O Drive | Dent/Damage | | Due to material handling | Keep the material with nylon net to avoid material to material contact |

Results & Conclusion:-

A passionate patron emphasis, superior process design and a robust encouraged leadership are vital ingredient to the procedure for the success of any business organization. Business Process Reengineering is the approach that each organization should adopt to attain their fundamentals for success. Neither it provide a sensation cure on a tray nor a painless quick fix, rather it promotes arduous hard work and activate the people involved to not only the alteration what they do but targets at varying their basic way of thinking itself. In this paper I have attempted in evolving a structured approach to reengineering

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Customer satisfaction report before-after BPR execution

