Middle-East Journal of Scientific Research 24 (9): 2981-2991, 2016
ISSN 1990-9233
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DOI: 10.5829/idosi.mejsr.2016.2981.2991

An Optimization Method for up and down Process with Maximum Profits Even Purchase Credit Situations with Fuzzy Sense

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Abstract: To develop fuzzy set theory and the fuzziness in the inventory problem, the purpose is to find the Revenue for defective quantity corresponds to the total cost and the associated cost of selling value of remodeled product with trade credit situations also fuzzy. This approach is to find the quantity which has the minimum cost with maximum profit. When the profit gained from selling one unit of the item with warranty periods and guaranty period Up process cost when in Down trade conditions and well planned Advertisement techniques must be gives some percentage of profits. Partial profit of planned operation on stock clearing and effective selling techniques, sustainable incomes of the end products has to be done.Mathematical model has been developed in below ways, (i) to find the fuzzy Down, Up process and Scrap clearing with the fuzzy relevant cost (ii) revenue related with fuzzy production cost and profit of the different lot sizes with interests of purchase cost of the products (iii) to find the Fuzzy up process with the screening cost of defective quantity with Advertisement dependent relevant cost tends to profits. Our aim is to find total cost and Profit with fuzzy sense. Numerical examples are given and sensitivity analysis is carried out to conclude the result.

Key words: Properties and Operators of fuzzy Number · Down Process · Up process · Interest · Fuzzy Revenue · Fuzzy Profit.

INRODUCTION

The advertisement make many things, one side defective products losing brand values, other side remodeled with discounted products of promotional offers. Comparison of scrap values to fully profitable Up process maximize the profit, that is Down trading move to Up Process. Defective things are remanufactured once governs with advertisement to the market with king of pride due to familiarity. Up process and planned scrap process will do all the roles of Profit making instead of partial loss in industry which will increase the revenue. End we have to pay the interest for purchasing amount under the trade credit situations.

Total cost includes holding cost, screening cost, Advertisement cost and interest of purchase cost. Proper screening and segregating process of goods will brings the revenue more. Sometimes, scraps will be used for models for teaching and raining purposes like old train engines, Ship parts, defense vehicles, mobile phones, gadgets, electronic items, heavy vehicle parts and aircrafts parts, so scrap or total waste moves to educational models used for training purposes.

Rate Optimization and different modulations discussed in [1, 2] is to identify a standard fuzzy system using different gradient methods and discuss their characteristics. Trapezoidal membership function used to find the optimization [3]. Vashisth Vikram *et al.* [4] by utilizing fuzzy theory based-topois, assessment of projects is done. Mathematical model for Economic Order quantity model with immediate return of defective items [5]. Mohammad Akhshabi and MostafaAkhshabi [6] dveloped multi criterion fuzzy variables are used to find optimization. Khashayar *et al.* [7] discussed the relationship between the travelled distance of the ant and the ant's control parameters are significant in increasing the hole drilling operation efficiencies. Techniques of Firm efficiency is associated with inventory write-down and overproduction is associated with inventory write-down found [8]. Roy *et al.* [9] is organized an inventory model for single period products with reordering opportunities under fuzzy demand.

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Syed Auon Raza *et al.* [10] is comprehensive review of Overcurrent relay Dependencies to the Topological Analysis of coordination techniques is presented also noticed heuristic optimization techniques. Genetic Algorithms with Binary Integer Programming Revenue Management in Fuzzy Logic developed [11]. The study is to measure efficiency in parametric Stochastic Frontier production systems in poultry sector in Fars Province Analysis (SFA) and the other method is non-parametric finding out better use of existing human and capital method Data Envelopment Analyzed [12]. The just-in-time management allows the organization to achieve this goal by increasing the efficiency of the production, reducing the level of wasted materials, time and effort involved in the production process [13]. Managing is one of the issues in waiting lines create a great dilemma for managers seeking techniques to improve the return on investment of their operations [14]. Operations on trapezoidal fuzzy numbers with uncertain conditions organized [15]. One is DOWN process it is used for Good Quality First Sale (GQFS) and second one UP Process is Defective Quality Second Sale (DQSS) and remaining defective products goes to scrap clearing section.

First section is Materials and methods of the findings, second section is two process are depends UP and DOWN Process. Third is the mathematical models in fuzzy environment has to solve with UP and DOWN process. Fourth, five and six section explanation of numerical examples for process is Comparison of Products with direct Profit and Return of Products with indirect Profit, addition of this two we will get Total profit and actions should be taken for increase the ownership costs scrap clearing cost also included. Finally section seven, conclusion and future research.

Notations and Assumptions:

~ wavy bar indicates fuzzification of parameters.

$\widetilde{DP}$ is the Down Process.

$\widetilde{UP}$ is the Up Process.

$\widetilde{SP}$ is the Scrap Process.

$\widetilde{D_q}$ is the Fuzzy Demand quantity

$\widetilde{R_{Uc}}$ is the Total Purchase cost

$\widetilde{R_{Ur}}$ is the Purchase cost of each lots

$\widetilde{H}$ is the Holding cost

$\widetilde{O}$ is the Ordering or setup cost

$\tilde{r}$ is the Order quantity in Down Process

$\tilde{r}^{*}$ is the Order quantity in Up Process

$\tilde{r}^{**}$ is the Order quantity in Clearing/recycling Process

$\widetilde{L_r}$ is the Length of the plan

$\widetilde{L_1}$ is the Length of the plan in Down Process(30days)

$\widetilde{L_2}$ is the Length of the plan in Up process(30days)

$\widetilde{L_3}$ is the Length of the plan in Clearing Process(30days)

D_f is the percentage of Defective items

Let $\tilde{r} = (1 - D_f\%)$ is the quantity of good items.

$\tilde{r}^{*} = (D_f)$ *is the defective quantity*, *here*, $D_f = a + b$

$\tilde{r}^{**} = b$ is the clearing / scrap quantity

Assume,

$D_f(\alpha, \beta, \gamma, \delta) = (5,10,15,20)\%$

R_1 is the Testing and dismantling (depreciation cost)
R_2 is the Labor cost
R_3 is the Additional Material cost/ Upgrading and quality test cost
R_4 is the Scrap cost
Cc is the Clearing Charges.

$\widetilde{SV_G}$ is the Selling value in down process per unit

$\widetilde{SV_D}$ is the Selling value in Up process per unit

$\widetilde{SV_c}$ is the Selling value in clearing section per unit

$[\widetilde{R_{ev1}DN}]$ is the Revenue in Down Process

$[\widetilde{R_{ev2}UP}]$ is the Revenue in Up Process

$[\widetilde{R_{ev}Rc}]$ is the Revenue in Recycling Process

$[\widetilde{P_1DN}]$ is the gain in Down Process

$[\widetilde{P_2UP}]$ is the gain in Up Process

$[\widetilde{P_3Rc}]$ is the gain in Recycling/scrap Process

$[\widetilde{TDN}]$ is the Total Cost in Down Process

$[\widetilde{TUP}]$ is the Total cost in UP Process

$[\widetilde{TRC}]$ Total cost of Recycling/scrap Process

A_d is the Advertisement cost per unit time

IC_1 is the interest cost L_1 Period.
IC_2 is the interest cost in L_2 Period.
Ti_c is the Total interest cost.
I_r is the interest rate, here, r=1, 2

Mathematical Model Formulations: To find the Holding cost, ordering cost and Purchase cost for Defective items,

$$[\widetilde{PC}] = \widetilde{R_{Uc}} \otimes \tilde{r}$$

$$[\widetilde{PC}] = (\widetilde{R_{U1}}, \widetilde{R_{U2}}, \widetilde{R_{U3}}, \widetilde{R_{U4}}) \otimes (\tilde{r_1}, \tilde{r_2}, \tilde{r_3}, \tilde{r_4})$$

$$[\widetilde{PC}] = (\widetilde{R_{U1}} \otimes \tilde{r_1}, \widetilde{R_{U2}} \otimes \tilde{r_2}, \widetilde{R_{U3}} \otimes \tilde{r_3}, \widetilde{R_{U4}} \otimes \tilde{r_4}) \quad (1)$$

$$\text{Holding Cost in Fuzzy Sense} = \tilde{H} \otimes \tilde{r} \otimes \tilde{L}_r \oslash 2 \quad (2)$$

$$\text{Ordering cost in fuzzy sense} = \tilde{O} \otimes \tilde{D_q} \oslash \tilde{r} \quad (3)$$

To find total cost,
From equation (2), (3),
Advertisement includes Television, Internet, banners, bam lets etc.

$$[\widetilde{TDS}] = [\tilde{H} \otimes \tilde{r} \otimes \tilde{L}_r \oplus \tilde{O} \otimes \tilde{D_q} \oslash \tilde{r}] \oplus A_d \otimes L_1 \quad (4)$$

To find Total Cost in DOWN process,

$$[\widetilde{TDN}] = [\tilde{H} \otimes \tilde{r} \otimes \tilde{L}_r \oslash 2 \oplus \tilde{O} \otimes \tilde{D_q} \oslash \tilde{r}] \oplus A_d \otimes L_1$$

$$[\widetilde{TDN}] = \left[\widetilde{H_1} \otimes \tilde{r_1} \otimes \tilde{L} \oslash 2 \oplus \widetilde{O_1} \otimes \widetilde{D_1} \oslash \tilde{r} \oplus A_d \otimes L_1, \widetilde{H_2} \otimes \tilde{r_2} \otimes \tilde{L} \oslash 2 \oplus \widetilde{O_2} \otimes \widetilde{D_2} \oslash \tilde{r} \oplus A_d \otimes L_1, \widetilde{H_3} \otimes \tilde{r_3} \otimes \tilde{L} \oslash 2 \oplus \widetilde{O_3} \otimes \widetilde{D_3} \oslash \tilde{r} \oplus A_d \otimes L_1, \widetilde{H_4} \otimes \tilde{r_4} \otimes \tilde{L} \oslash 2 \oplus \widetilde{O_4} \otimes \widetilde{D_4} \oslash \tilde{r} \oplus A_d \otimes L_1\right] \quad (5)$$

Let $\tilde{r}^* = (1 - D_{f\%})$

$$\tilde{r}^{**} = (D_{f\%}) \ \ here, \ D_{f\%} = a + b \quad (6)$$

$$\tilde{r}^{**} = b$$

To Find Total Cost in UP Process: Total cost in UP process= Holding cost + Testing and Dismantling cost + Labor cost+ Additional Material cost/ Upgrading and quality test cost+ Advertisement cost[1]

$$[\widetilde{TUP}] = [\tilde{H} \otimes \tilde{r^*} \otimes \tilde{L}_2 \oslash 2] \oplus [(R_1 \oplus R_2) \otimes \tilde{r^*}] \oplus [(R_3) \otimes (\tilde{r^*} \sim \tilde{r^{**}})] \oplus A_d \otimes L_2$$

(i.e.) $\tilde{r_1^*} \sim \tilde{r_1^{**}}$,

$\tilde{r_2^*} \sim \tilde{r_2^{**}}, \tilde{r_3^*} \sim \tilde{r_3^{**}}, \quad \tilde{r_4^*} \sim \tilde{r_4^{**}}$

$$[\widetilde{TUP}] = [\widetilde{H_1} \otimes \tilde{r_1}^* \otimes \tilde{L}_2 \oslash 2 \oplus [(R_1 \oplus R_2) \otimes D_{f\%}] \oplus [(R_3) \otimes (a)] \oplus A_d \otimes L_2, \widetilde{H_2} \otimes \tilde{r_2}^* \otimes \tilde{L}_2 \oslash 2 \oplus [(R_1 \oplus R_2) \otimes D_{f\%}] \oplus [(R_3) \otimes (a)] \oplus A_d \otimes L_2, \widetilde{H_3} \otimes \tilde{r_3}^* \otimes \tilde{L}_2 \oslash 2 \oplus [(R_1 \oplus R_2) \otimes D_{f\%}] \oplus [(R_3) \otimes (a)] \oplus A_d \otimes L_2, \widetilde{H_4} \otimes \tilde{r_4}^* \otimes \tilde{L}_2 \oslash 2 \oplus [(R_1 \oplus R_2) \otimes D_{f\%}] \oplus [(R_3) \otimes (a)]] \oplus A_d \otimes L_2 \quad (7)$$

To Find the Total Cost of Recycling/Clearing scrap Process,

$$[\widetilde{TRC}] = [(\widetilde{H_1},\widetilde{H_2},\widetilde{H_3},\widetilde{H_4}) \otimes (\tilde{r}_1^{**},\tilde{r}_2^{**},\tilde{r}_3^{**},\tilde{r}_4^{**}) \otimes \tilde{L}_3 \oslash 2] \oplus [(R_4 \otimes \widetilde{r^{**}}) \oplus (Cc \otimes \widetilde{r^{**}}) \oplus A_d \otimes$$

$$[\widetilde{TRC}] = [\widetilde{H_1} \otimes \tilde{r}_1^{**} \otimes \tilde{L}_3 \oslash 2 \oplus [(R_4 \otimes \widetilde{r^{**}}) \oplus (Cc \otimes \widetilde{r^{**}})], \widetilde{H_2} \otimes \tilde{r}_2^{**} \otimes \tilde{L}_3 \oslash 2 \oplus [(R_4 \otimes \widetilde{r^{**}}) \oplus (Cc \otimes \widetilde{r^{**}})], \widetilde{H_3} \otimes \tilde{r}_3^{**} \otimes \tilde{L}_3 \oslash 2 \oplus [(R_4 \otimes \widetilde{r^{**}}) \oplus (Cc \otimes \widetilde{r^{**}})], \widetilde{H_4} \otimes \tilde{r}_4^{**} \otimes \tilde{L}_3 \oslash 2 \oplus [(R_4 \otimes \widetilde{r^{**}}) \oplus (Cc \otimes \widetilde{r^{**}})] \oplus A_d \otimes L_3$$

$$[\widetilde{TRC}] = [\widetilde{H_1} \otimes \tilde{r}_1^{**} \otimes \tilde{L}_3 \oslash 2 \oplus [(R_4 \otimes b) \oplus (Cc \otimes b)] \oplus A_d \otimes L_3, \widetilde{H_2} \otimes \tilde{r}_2^{**} \otimes \tilde{L}_3 \oslash 2 \oplus [(R_4 \otimes b) \oplus (Cc \otimes b)] \oplus A_d \otimes L_3, \widetilde{H_3} \otimes \tilde{r}_3^{**} \otimes \tilde{L}_3 \oslash 2 \oplus [(R_4 \otimes b) \oplus (Cc \otimes b)] \oplus A_d \otimes L_3, \widetilde{H_4} \otimes \tilde{r}_4^{**} \otimes \tilde{L}_3 \oslash 2[(R_4 \otimes b)(Cc \otimes \widetilde{r^{**}})] \oplus A_d \otimes L_3] \quad (8) \qquad (8)$$

To Find the Revenue in down Process:

Let V = V_1, V_2, V_3 in three revenue periods up, down and Scrap clearing sections

$$Let\ \tilde{r} = (\tilde{r}_1,\tilde{r}_2,\tilde{r}_3,\tilde{r}_4)\ and\ \widetilde{SV_G} = (\widetilde{SV_1},\widetilde{SV_2},\widetilde{SV_3},\widetilde{SV_4})\tilde{r}^* = (\tilde{r}_1^*,\tilde{r}_2^*,\tilde{r}_3^*,\tilde{r}_4^*)\ and\ \widetilde{SV_D} = (\widetilde{SV_1},\widetilde{SV_2},\widetilde{SV_3},\widetilde{SV_4})\tilde{r}^* = (\tilde{r}_1^{**},\tilde{r}_2^{**},\tilde{r}_3^{**},\tilde{r}_4^{**})\ and\ \widetilde{SV_c} = (\widetilde{SV_1},\widetilde{SV_2},\widetilde{SV_3},\widetilde{SV_4})$$

are trapezoidal Fuzzy numbers then,

$$[\widetilde{R_{sv}DN}] = \text{Selling PriceXQuantit in Down process}$$

$$[\widetilde{R_{sv1}DN}] = [(\widetilde{SV_1} \otimes \tilde{r}_1, \widetilde{SV_2} \otimes \tilde{r}_2, \widetilde{SV_3} \otimes \tilde{r}_3, \widetilde{SV_4} \otimes \tilde{r}_4)] \quad (9)$$

To Find the Gain in down Process:
Let F=F_1, F2, F3 are the Profit in three places are Down, Up and Scrap clearing sections.
Profit = Revenue - Total Cost

$$[\widetilde{P_F DN}] = [\widetilde{R_{sv}DN}] \ominus [\widetilde{TDN}]$$

$$[\widetilde{P_1 DN}] = \left[[\widetilde{SV_1} \otimes \tilde{r}_1, \widetilde{SV_2} \otimes \tilde{r}_2, \widetilde{SV_3} \otimes \tilde{r}_3, \widetilde{SV_4} \otimes \tilde{r}_4] \ominus [\widetilde{H_1} \otimes \tilde{r}_1 \otimes \tilde{L} \oslash 2 \oplus \widetilde{O_1} \otimes \widetilde{D_1} \oslash \tilde{r} \oplus A_d \otimes L_1, \widetilde{H_2} \otimes \tilde{r}_2 \otimes \tilde{L} \oslash 2 \oplus \widetilde{O_2} \otimes \widetilde{D_2} \oslash \tilde{r} \oplus A_d \otimes L_1, \widetilde{H_3} \otimes \tilde{r}_3 \otimes \tilde{L} \oslash 2 \oplus \widetilde{O_3} \otimes \widetilde{D_3} \oslash \tilde{r} \oplus A_d \otimes L_1, \widetilde{H_4} \otimes \tilde{r}_4 \otimes \tilde{L} \oslash 2 \oplus \widetilde{O_4} \otimes \widetilde{D_4} \oslash \tilde{r} \oplus A_d \otimes L_1]\right]$$

{By the equation (5) and (9)}

$$[\widetilde{P_1 DN}] = [\widetilde{SV_1} \otimes \tilde{r}_1 \ominus \widetilde{H_1} \otimes \tilde{r} \otimes \tilde{L}_1 \oslash 2 \oplus \widetilde{O_1} \otimes \widetilde{D_1} \oslash \tilde{r} \oplus A_d \otimes L_1, \widetilde{SV_2} \otimes \tilde{r}_2 \ominus \widetilde{H_2} \otimes \tilde{r}_2 \otimes \tilde{L}_1 \oslash 2 \oplus \widetilde{O_2} \otimes \widetilde{D_2} \oslash \tilde{r} \oplus A_d \otimes L_1, \widetilde{SV_3} \otimes \tilde{r}_3 \ominus \widetilde{H_3} \otimes \tilde{r}_3 \otimes \tilde{L}_1 \oslash 2 \oplus \widetilde{O_3} \otimes \widetilde{D_3} \oslash \tilde{r} \oplus A_d \otimes L_1, \widetilde{SV_4} \otimes \tilde{r}_4 \ominus \widetilde{H_4} \otimes \tilde{r}_4 \otimes \tilde{L}_1 \oslash 2 \oplus \widetilde{O_4} \otimes \widetilde{D_4} \oslash \tilde{r} \oplus A_d \otimes L_1] \quad (10)$$

To Find the Revenue in UP Process,

$$[\widetilde{R_{sv2}DN}] = \left[\left(\widetilde{SV_1} \otimes \tilde{r}_1^{\,*}, \widetilde{SV_2} \otimes \tilde{r}_2^{\,*}, \widetilde{SV_3} \otimes \tilde{r}_3^{\,*}, \widetilde{SV_4} \otimes \tilde{r}_4^{\,*}\right)\right] (11)$$

To Find the Gain in UP Process,

$$[\widetilde{P_2UP}] = \left[\left[\widetilde{SV_1} \otimes \tilde{r}_1^{\,*}, \widetilde{SV_2} \otimes \tilde{r}_2^{\,*}, \widetilde{SV_3} \otimes \tilde{r}_3^{\,*}, \widetilde{SV_4} \otimes \tilde{r}_4^{\,*}\right] \ominus \left[\widetilde{H_1} \otimes \tilde{r}_1^{\,*} \otimes \tilde{L}_2 \oslash 2 \oplus [(R_1 \oplus R_2) \otimes D_{f\%}] \oplus [(R_3) \otimes (a)] \oplus A_d \otimes L_2, \widetilde{H_2} \otimes \tilde{r}_2^{\,*} \otimes \tilde{L}_2 \oslash 2 \oplus [(R_1 \oplus R_2) \otimes D_{f\%}] \oplus [(R_3) \otimes (a)] \oplus A_d \otimes L_2, \widetilde{H_3} \otimes \tilde{r}_3^{\,*} \otimes \tilde{L}_2 \oslash 2 \oplus [(R_1 \oplus R_2) \otimes D_{f\%}] \oplus [(R_3) \otimes (a)] \oplus A_d \otimes L_2, \widetilde{H_4} \otimes \tilde{r}_4^{\,*} \otimes \tilde{L}_2 \oslash 2 \oplus [(R_1 \oplus R_2) \otimes D_{f\%}] \oplus [(R_3) \otimes (a)]\right] \oplus A_d \otimes L_2\right]$$

{By the equation (7) and (11)}

$$[\widetilde{P_2UP}] = [\widetilde{SV_1} \otimes \tilde{r}_1^{\,*} \ominus \widetilde{H_1} \otimes \tilde{r}_1^{\,*} \otimes \tilde{L}_2 \oslash 2 \oplus [(R_1 \oplus R_2) \otimes D_{f\%}] \oplus [(R_3) \otimes (a)] \oplus A_d \otimes L_2, \widetilde{SV_2} \otimes \tilde{r}_2^{\,*} \ominus \widetilde{H_2} \otimes \tilde{r}_2^{\,*} \otimes \tilde{L}_2 \oslash 2 \oplus [(R_1 \oplus R_2) \otimes D_{f\%}] \oplus [(R_3) \otimes (a)] \oplus A_d \otimes L_2, \widetilde{SV_3} \otimes \tilde{r}_3^{\,*} \ominus \widetilde{H_3} \otimes \tilde{r}_3^{\,*} \otimes \tilde{L}_2 \oslash 2 \oplus [(R_1 \oplus R_2) \otimes D_{f\%}] \oplus [(R_3) \otimes (a)] \oplus A_d \otimes L_2, \widetilde{SV_4} \otimes \tilde{r}_4^{\,*} \ominus \widetilde{H_4} \otimes \tilde{r}_4^{\,*} \otimes \tilde{L}_2 \oslash 2 \oplus [(R_1 \oplus R_2) \otimes D_{f\%}] \oplus [(R_3) \otimes (a)] \oplus A_d \otimes L_2] \quad (12)$$

Here, $IC_1 = \widetilde{P_{Ur}} \otimes L_r \otimes I_r\%$

When, r=1,

$$IC_1 = \left(\widetilde{P_{U1}}, \widetilde{P_{U2}}, \widetilde{P_{U3}}, \widetilde{P_{U4}}\right) \otimes L_1 \otimes I_1\%$$

$$IC_1 = \left(\widetilde{P_{U1}} \otimes L_2 \otimes I_1\%, \widetilde{P_{U2}} \otimes L_2 \otimes I_1\%, \widetilde{P_{U3}} \otimes L_2 \otimes I_1\%, \widetilde{P_{U4}} \otimes L_2 \otimes I_1\%\right) \quad (12(a))$$

To Find the Revenue in Clearing/Recycling Process,

$$[\widetilde{R_{s2}RC}] = \left[\left(\widetilde{SV_1} \otimes \tilde{r}_1^{\,**}, \widetilde{SV_2} \otimes \tilde{r}_2^{\,**}, \widetilde{SV_3} \otimes \tilde{r}_3^{\,**}, \widetilde{SV_4} \otimes \tilde{r}_4^{\,**}\right)\right] \quad (13)$$

To Find the Gain in Recycling/scrap Process,

$$[\widetilde{P_3RC}] = \left[\left[\left(\widetilde{SV_1} \otimes \tilde{r}_1^{\,**}, \widetilde{SV_2} \otimes \tilde{r}_2^{\,**}, \widetilde{SV_3} \otimes \tilde{r}_3^{\,**}, \widetilde{SV_4} \otimes \tilde{r}_4^{\,**}\right)\right] \ominus \left[\widetilde{H_1} \otimes \tilde{r}_1^{\,**} \otimes \tilde{L}_3 \oslash 2 \oplus [(R_4 \otimes b) \oplus (Cc \otimes b)] \oplus A_d \otimes L_3, \widetilde{H_2} \otimes \tilde{r}_2^{\,**} \otimes \tilde{L}_3 \oslash 2 \oplus [(R_4 \otimes b) \oplus (Cc \otimes b)] \oplus A_d \otimes L_3, \widetilde{H_3} \otimes \tilde{r}_3^{\,**} \otimes \tilde{L}_3 \oslash 2 \oplus [(R_4 \otimes b) \oplus (Cc \otimes b)] \oplus A_d \otimes L_3, \widetilde{H_4} \otimes \tilde{r}_4^{\,**} \otimes \tilde{L}_3 \oslash 2[(R_4 \otimes b)(Cc \otimes \tilde{r}^{**})] \oplus A_d \otimes L_3\right]\right]$$

{By the Equation (8)and (13)}

$$[\widetilde{P_3RC}] = \left[\left(\widetilde{SV_1} \otimes \tilde{r}_1^{\,**} \ominus \widetilde{H_1} \otimes \tilde{r}_1^{\,**} \otimes \tilde{L}_3 \oslash 2 \oplus [(R_4 \otimes b) \oplus (Cc \otimes b)], \widetilde{SV_2} \otimes \tilde{r}_2^{\,**} \ominus \widetilde{H_2} \otimes \tilde{r}_2^{\,**} \otimes \tilde{L}_3 \oslash 2 \oplus [(R_4 \otimes b) \oplus (Cc \otimes b)] \oplus A_d \otimes L_3, \widetilde{SV_3} \otimes \tilde{r}_3^{\,**} \ominus \widetilde{H_3} \otimes \tilde{r}_3^{\,**} \otimes \tilde{L}_3 \oslash 2 \oplus [(R_4 \otimes b) \oplus (Cc \otimes b)] \oplus A_d \otimes L_3, \widetilde{SV_4} \otimes \tilde{r}_4^{\,**} \ominus \widetilde{H_4} \otimes \tilde{r}_4^{\,**} \otimes \tilde{L}_3 \oslash 2 \oplus [(R_4 \otimes b) \oplus (Cc \otimes b)] \oplus A_d \otimes L_3)\right] \quad (14)$$

When, r=2

$$IC_2 = \left(\widetilde{P_{U1}}, \widetilde{P_{U2}}, \widetilde{P_{U3}}, \widetilde{P_{U4}}\right) \otimes L_2 \otimes I_1\% IC_2 = \left(\widetilde{P_{U1}} \otimes L_3 \otimes I_1\%, \widetilde{P_{U2}} \otimes L_3 \otimes I_1\%, \widetilde{P_{U3}} \otimes L_3 \otimes I_1\%, \widetilde{P_{U4}} \otimes L_3 \otimes I_1\%\right) \quad (14(a))$$

Adding equation (10), (12) and (14) we will get the Total Profit of the en

$$[\widetilde{TPr}] = \left[\widetilde{SV_1} \otimes \tilde{r}_1 \ominus \widetilde{H_1} \otimes \tilde{r} \otimes \tilde{L}_1 \oslash 2 \oplus \widetilde{O_1} \otimes \widetilde{D_1} \oslash \tilde{r} \oplus A_d \otimes L_1, \widetilde{SV_2} \otimes \tilde{r}_2 \ominus \widetilde{H_2} \otimes \tilde{r}_2 \otimes \tilde{L}_1 \oslash 2 \oplus \widetilde{O_2} \otimes \widetilde{D_2} \oslash \tilde{r} \oplus A_d \otimes L_1, \widetilde{SV_3} \otimes \tilde{r}_3 \ominus \widetilde{H_3} \otimes \tilde{r}_3 \otimes \tilde{L}_1 \oslash 2 \oplus \widetilde{O_3} \otimes \widetilde{D_3} \oslash \tilde{r} \oplus A_d \widetilde{SV_4} \otimes \tilde{r}_4 \ominus \widetilde{H_4} \otimes \tilde{r}_4 \otimes \tilde{L}_1 \oslash 2 \oplus \widetilde{O_4} \otimes \widetilde{D_4} \oslash \tilde{r} \oplus A_d \otimes L_1\right] \oplus \left[\widetilde{SV_1} \otimes \tilde{r}_1^* \ominus \widetilde{H_1} \otimes \tilde{r}_1^* \otimes \tilde{L}_2 \oslash 2 \oplus [(R_1 \oplus R_2) \otimes D_{f\%}] \oplus [(R_3) \otimes (a)] \oplus A_d \otimes L_2, \widetilde{SV_2} \otimes \tilde{r}_2^* \ominus \widetilde{H_2} \otimes \tilde{r}_2^* \otimes \tilde{L}_2 \oslash 2 \oplus [(R_1 \oplus R_2) \otimes D_{f\%}] \oplus [(R_3) \otimes (a)] \oplus A_d \otimes L_2, \widetilde{SV_3} \otimes \tilde{r}_3^* \ominus \widetilde{H_3} \otimes \tilde{r}_3^* \otimes \tilde{L}_2 \oslash 2 \oplus [(R_1 \oplus R_2) \otimes D_{f\%}] \oplus [(R_3) \otimes (a)] \oplus A_d \otimes L_2, \widetilde{SV_4} \otimes \tilde{r}_4^* \ominus \widetilde{H_4} \otimes \tilde{r}_4^* \otimes \tilde{L}_2 \oslash 2 \oplus [(R_1 \oplus R_2) \otimes D_{f\%}] \oplus [(R_3) \otimes (a)] \oplus A_d \otimes L_2\right] \oplus \left[\left(\widetilde{SV_1} \otimes \tilde{r}_1^{**} \ominus \widetilde{H_1} \otimes \tilde{r}_1^{**} \otimes \tilde{L}_3 \oslash 2 \oplus [(R_4 \otimes b) \oplus (Cc \otimes b)], \widetilde{SV_2} \otimes \tilde{r}_2^{**} \ominus \widetilde{H_2} \otimes \tilde{r}_2^{**} \otimes \tilde{L}_3 \oslash 2 \oplus [(R_4 \otimes b) \oplus (Cc \otimes b)] \oplus A_d \otimes L_3, \widetilde{SV_3} \otimes \tilde{r}_3^{**} \ominus \widetilde{H_3} \otimes \tilde{r}_3^{**} \otimes \tilde{L}_3 \oslash 2 \oplus [(R_4 \otimes b) \oplus (Cc \otimes b)] \oplus A_d \otimes L_3, \widetilde{SV_4} \otimes \tilde{r}_4^{**} \ominus \widetilde{H_4} \otimes \tilde{r}_4^{**} \otimes \tilde{L}_3 \oslash 2 \oplus [(R_4 \otimes b) \oplus (Cc \otimes b)] \oplus A_d \otimes L_3\right)\right] \quad (15)$$

Finally,

$$[\widetilde{TP}] = [\widetilde{TPr}] \ominus (\tilde{P}_{Uc} \otimes \tilde{r}) \ominus [IC_1 \oplus IC_2]$$

From (1), 12(a), 14(a) and (15), we get,

$$[\widetilde{TP}] = \left[\widetilde{SV_1} \otimes \tilde{r}_1 \ominus \widetilde{H_1} \otimes \tilde{r} \otimes \tilde{L}_1 \oslash 2 \oplus \widetilde{O_1} \otimes \widetilde{D_1} \oslash \tilde{r} \oplus A_d \otimes L_1, \widetilde{SV_2} \otimes \tilde{r}_2 \ominus \widetilde{H_2} \otimes \tilde{r}_2 \otimes \tilde{L}_1 \oslash 2 \oplus \widetilde{O_2} \otimes \widetilde{D_2} \oslash \tilde{r} \oplus A_d \otimes L_1, \widetilde{SV_3} \otimes \tilde{r}_3 \ominus \widetilde{H_3} \otimes \tilde{r}_3 \otimes \tilde{L}_1 \oslash 2 \oplus \widetilde{O_3} \otimes \widetilde{D_3} \oslash \tilde{r} \oplus A_d \otimes L_1, \widetilde{SV_4} \otimes \tilde{r}_4 \ominus \widetilde{H_4} \otimes \tilde{r}_4 \otimes \tilde{L}_1 \oslash 2 \oplus \widetilde{O_4} \otimes \widetilde{D_4} \oslash \tilde{r} \oplus A_d \otimes L_1\right] \oplus \left[\widetilde{SV_1} \otimes \tilde{r}_1^* \ominus \widetilde{H_1} \otimes \tilde{r}_1^* \otimes \tilde{L}_2 \oslash 2 \oplus [(R_1 \oplus R_2) \otimes D_{f\%}] \oplus [(R_3) \otimes (a)] \oplus A_d \otimes L_2, \widetilde{SV_2} \otimes \tilde{r}_2^* \ominus \widetilde{H_2} \otimes \tilde{r}_2^* \otimes \tilde{L}_2 \oslash 2 \oplus [(R_1 \oplus R_2) \otimes D_{f\%}] \oplus [(R_3) \otimes (a)] \oplus A_d \otimes L_2, \widetilde{SV_3} \otimes \tilde{r}_3^* \ominus \widetilde{H_3} \otimes \tilde{r}_3^* \otimes \tilde{L}_2 \oslash 2 \oplus [(R_1 \oplus R_2) \otimes D_{f\%}] \oplus [(R_3) \otimes (a)] \oplus A_d \otimes L_2, \widetilde{SV_4} \otimes \tilde{r}_4^* \ominus \widetilde{H_4} \otimes \tilde{r}_4^* \otimes \tilde{L}_2 \oslash 2 \oplus [(R_1 \oplus R_2) \otimes D_{f\%}] \oplus [(R_3) \otimes (a)] \oplus A_d \otimes L_2\right] \oplus \left[\left(\widetilde{SV_1} \otimes \tilde{r}_1^{**} \ominus \widetilde{H_1} \otimes \tilde{r}_1^{**} \otimes \tilde{L}_3 \oslash 2 \oplus [(R_4 \otimes b) \oplus (Cc \otimes b)], \widetilde{SV_2} \otimes \tilde{r}_2^{**} \ominus \widetilde{H_2} \otimes \tilde{r}_2^{**} \otimes \tilde{L}_3 \oslash 2 \oplus [(R_4 \otimes b) \oplus (Cc \otimes b)] \oplus A_d \otimes L_3, \widetilde{SV_3} \otimes \tilde{r}_3^{**} \ominus \widetilde{H_3} \otimes \tilde{r}_3^{**} \otimes \tilde{L}_3 \oslash 2 \oplus [(R_4 \otimes b) \oplus (Cc \otimes b)] \oplus A_d \otimes L_3, \widetilde{SV_4} \otimes \tilde{r}_4^{**} \ominus \widetilde{H_4} \otimes \tilde{r}_4^{**} \otimes \tilde{L}_3 \oslash 2 \oplus [(R_4 \otimes b) \oplus (Cc \otimes b)] \oplus A_d \otimes L_3\right)\right] \ominus \left(\widetilde{P_{U_1}} \otimes \tilde{r}_1, \widetilde{P_{U_2}} \otimes \tilde{r}_2, \widetilde{P_{U_3}} \otimes \tilde{r}_3, \widetilde{P_{U_4}} \otimes \tilde{r}_4\right) \ominus \left[\left(\widetilde{P_{U_1}} \otimes L_3 \otimes I_1\%, \widetilde{P_{U_2}} \otimes L_3 \otimes I_1\%, \widetilde{P_{U_3}} \otimes L_3 \otimes I_1\%, \widetilde{P_{U_4}} \otimes L_3 \otimes I_1\%\right) \oplus \left(\widetilde{P_{U_1}} \otimes L_3 \otimes I_2\%, \widetilde{P_{U_2}} \otimes L_3 \otimes I_2\%, \widetilde{P_{U_3}} \otimes L_3 \otimes I_2\%, \widetilde{P_{U_4}} \otimes L_3 \otimes I_2\%\right)\right] \quad (16)$$

Problem Calculation: In a good reputed organization with four fast moving manufacturing defective gadgets, purchase cost is (15, 000, 12000, 9000, 6000), 40% marginal Profit and ordering cost is Rs.0.5 per unit price, holding cost Rs.2 per unit hold, selling value of four categories are in stages with for defectives, loosing amount of 25% depreciation cost in the repairing process and 93% of losing value in Scrap Process.0.53%, 2.7 %, 1.33%, 4% and 2% are the Testing, Labor, Additional materials, scrap and clearing charges respectively. Advertisement cost is 100/day. Here, (4000, 3000, 2000 and 1000) are the Number of gadget and Guaranty, warranty and scrap Periods are 30days. In trade credit situations, Interest for more than 30days is 0.25% and more than 60days is 0.5%. Find the Total Profit.

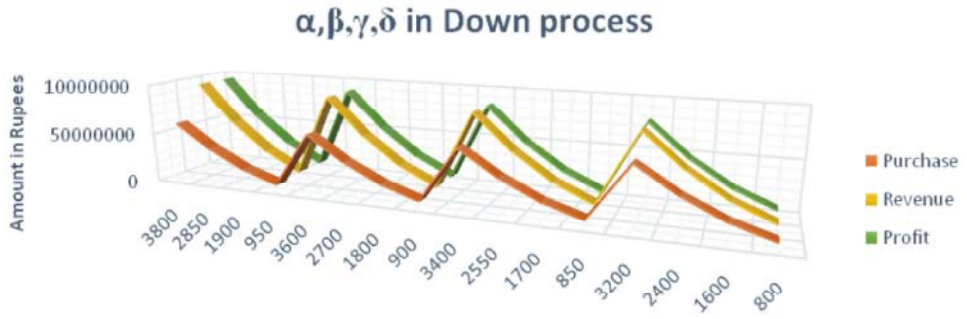
Tables and Graphs

No part payment allowed of ordered goods from the distributor to the manufacturer in the middle of the trade. At the same time Holding cost for the keeping the gadgets only for that day it depends the quantity.

For down Process Without Interest Table: 1

	$\tilde{r}$	$N\tilde{r}$	$\tilde{P}_{Uc} \otimes \tilde{r}$	$\tilde{O}$	$\tilde{H}$	$A_d XL_1$	$\left[\tilde{T}\tilde{D}\tilde{N}\right]$	$\tilde{S}V_G$	$[\widetilde{R_{sv1}DN}]$	$[\widetilde{P_1DN}]$
α	4000	3800	60000000	2000	120000	3000	125000	25000	95000000	94875000
	3000	2850	36000000	1500	90000	3000	94500	20000	57000000	56905500
	2000	1900	18000000	1000	60000	3000	64000	15000	28500000	28436000
	1000	950	6000000	500	30000	3000	33500	10000	9500000	9466500
β	4000	3600	60000000	2000	120000	3000	125000	25000	90000000	89875000
	3000	2700	36000000	1500	90000	3000	94500	20000	54000000	53875000
	2000	1800	18000000	1000	60000	3000	64000	15000	27000000	26936000
	1000	900	6000000	500	30000	3000	33500	10000	9000000	8966500
γ	4000	3400	60000000	2000	120000	3000	125000	25000	85000000	84875000
	3000	2550	36000000	1500	90000	3000	94500	20000	51000000	50905500
	2000	1700	18000000	1000	60000	3000	64000	15000	25500000	25436000
	1000	850	6000000	500	30000	3000	33500	10000	8500000	8466500
δ	4000	3200	60000000	2000	120000	3000	125000	25000	80000000	79875000
	3000	2400	36000000	1500	90000	3000	94500	20000	48000000	47905500
	2000	1600	18000000	1000	60000	3000	64000	15000	24000000	23936000
	1000	800	6000000	500	30000	3000	33500	10000	8000000	7966500

Graphical Representation: 1



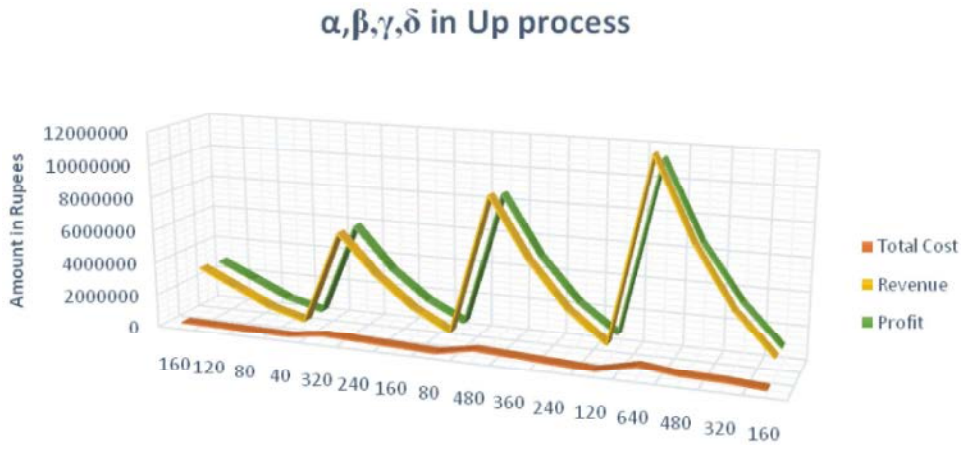
Up Process I1% Table: 2:

Lots	I1%with L2 and $\tilde{P}_{Uc}$
Lot1	4500000
Lot2	2700000
Lot3	1350000
Lot4	450000

Up Process Table: 3

D_f	$\tilde{r}$	$N\tilde{r}$	$\tilde{SV}_D$	$\tilde{H}$	R_1	R_2	R_3	$(R_1+R_2)\tilde{r}+R_3(a)$	$A_d XL_2$	$[\tilde{T}\tilde{U}\tilde{P}]$	$[\widetilde{R_{sv2}UP}]$	$[\widetilde{P_2UP}]$
α	200	160	18750	6000	20000	100000	40000	160000	3000	169000	3000000	2831000
	150	120	15000	4500	15000	75000	30000	120000	3000	127500	1950000	1822500
	100	80	11250	3000	10000	50000	20000	80000	3000	86000	900000	814000
	50	40	7500	1500	5000	25000	10000	40000	3000	44500	300000	255500
β	400	320	18750	12000	40000	200000	80000	320000	3000	335000	6000000	5881000
	300	240	15000	9000	30000	150000	60000	240000	3000	252000	3600000	3348000
	200	160	11250	6000	20000	100000	40000	160000	3000	169000	1800000	1631000
	100	80	7500	3000	10000	50000	20000	80000	3000	86000	600000	514000
γ	600	480	18750	18000	60000	300000	120000	480000	3000	501000	9000000	8599000
	450	360	15000	13500	45000	225000	90000	360000	3000	376500	5400000	5023500
	300	240	11250	9000	30000	150000	60000	240000	3000	252000	2700000	2448000
	150	120	7500	4500	15000	75000	30000	120000	3000	127500	900000	772500
δ	800	640	18750	24000	80000	400000	160000	640000	3000	667000	12000000	11333000
	600	480	15000	18000	60000	300000	120000	372000	3000	393000	7200000	6699000
	400	320	11250	12000	40000	200000	80000	320000	3000	335000	3600000	3445000
	200	160	7500	6000	20000	100000	40000	160000	3000	169000	1200000	1031000

Graphic Alrepresentation: 2



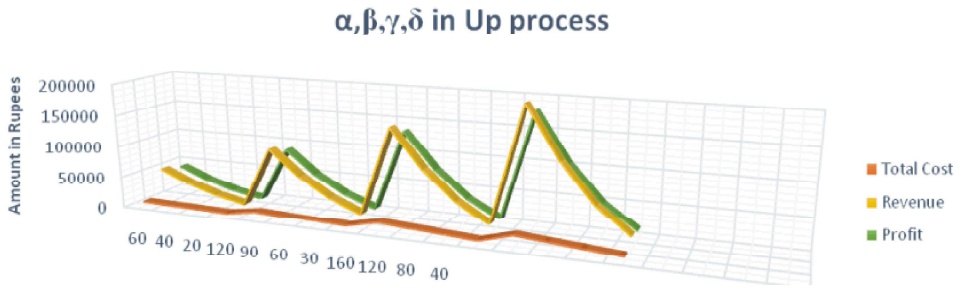
Scrap Process I2% Table: 4:

Lots	I2%with L3 and $\tilde{P}_{Uc}$
Lot1	9000000
Lot2	5400000
Lot3	2700000
Lot4	900000

Scrap/Clearing Process with Interest Table 5:

D_f	$\widetilde{r^{ps}}$	$\widetilde{SV_{pc}}$	$\widetilde{H}$	R_4	C_c	$A_d XL_2$	$[\widetilde{TRC}]$	$[\widetilde{R_{sv3}Rc}]$	$[\widetilde{P_2RC}]$
α	40	1250	1200	2000	1000	3000	7200	50000	42800
	30	1000	900	1500	750	3000	6150	30000	23850
	20	750	600	1000	500	3000	5100	15000	9900
	10	500	300	500	250	3000	4050	5000	950
β	80	1250	2400	4000	2000	3000	11400	100000	88600
	60	1000	1800	3000	1500	3000	9300	60000	50700
	40	750	1200	2000	1000	3000	7200	30000	22800
	20	500	600	1000	500	3000	5100	10000	4900
γ	120	1250	3600	6000	3000	3000	15600	150000	134400
	90	1000	2700	4500	2250	3000	12450	90000	77550
	60	750	1800	3000	1500	3000	9300	45000	35700
	30	500	900	1500	750	3000	6150	15000	8850
δ	160	1250	4800	8000	4000	3000	19800	200000	180200
	120	1000	3600	6000	3000	3000	15600	120000	104400
	80	750	2400	4000	2000	3000	11400	60000	48600
	40	500	1200	2000	1000	3000	7200	20000	12800

Graphical Presenatation: 3



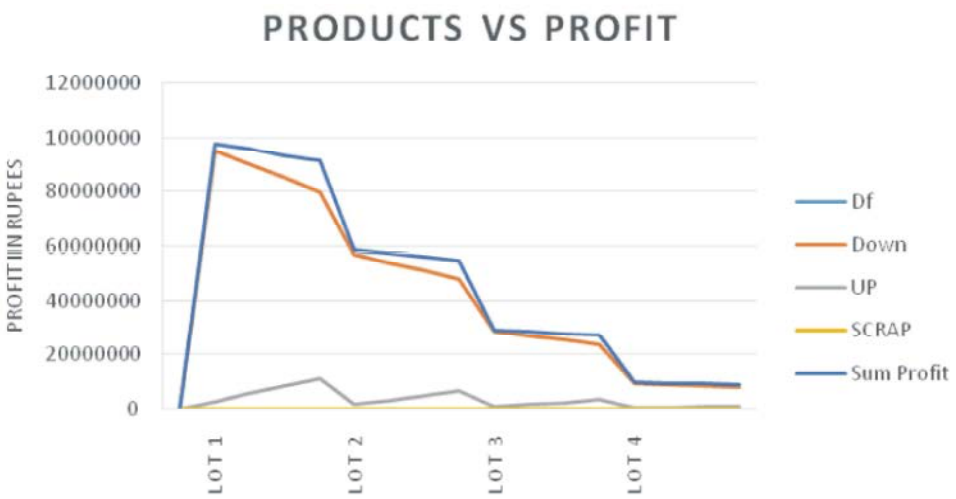
Inerest Table: 6

Lots	I_1%with L_2 and $\widetilde{P_{Uc}}$	I_2%with L_3 and $\widetilde{P_{Uc}}$	TI_c
Lot1	4500000	9000000	1350000
Lot2	2700000	5400000	8100000
Lot3	1350000	2700000	4050000
Lot4	450000	900000	1350000

Comparison of Lot Size and Profit with Down, up and Scrap Process Table: 7

Lot Size	D_f	$\widetilde{DP}$	$\widetilde{UP}$	$\widetilde{SP}$	Sum Profit	Total Profit
Lot 1	α	94875000	2831000	**42800**	97748800	36398800
	β	89875000	5881000	**88600**	95844600	34494600
	γ	84875000	8599000	**9900**	93483900	32133900
	δ	79875000	11333000	**180200**	91388200	30038200
Lot 2	α	56905500	1822500	**23850**	58751850	14651850
	β	53875000	3348000	**50700**	57273700	13173700
	γ	50905500	5023500	**22800**	55951800	11851800
	δ	47905500	6699000	**104400**	54708900	10608900
Lot 3	α	28436000	814000	**12900**	29262900	7212900
	β	26936000	1631000	**25800**	28592800	6542800
	γ	25436000	2448000	**35700**	27919700	5869700
	δ	23936000	3445000	**48600**	27429600	5379600
Lot 4	α	9466500	255500	**950**	9722950	2372950
	β	8966500	514000	**4900**	9485400	2135400
	γ	8466500	772500	**8850**	9247850	1897850
	δ	7966500	1031000	**12800**	9010300	1660300

Graphical Representation: 4:



CONCLUSION

From the Table (7) heavy loss can be avoided with Up process and addition to that scrap revenue also filled the gap of the gain percentage Moreover, graphical representations shows that complete loss reaches to profit percentage. From the tables (1) (3) (5) and (7), it can be observed that,

- Revenue is decreases when in the Down Process.
- Profit is moderate when in the Down process
- Good quality lot size is decreases when in down process but profit percentage increases.
- Again lot size decreases in the scrap process but total profit percentage increases slightly.
- Selling Price is stable when down process
- Selling Price is decreases when in Up process
- Selling price is highly decreases in scrap process.
- Profit is increases when in the Up process instead of loss.
- Partial Loss is increase when in the scrap process instead of full loss.
- Revenue is increases when in Up, Down and Scrap process with partial loss.
- Trade Credit situations with defective percentage also profitable.

Ordering and holding costs are same in all tables with respect to lot size but Profit percentage is varies due to defectives and losing the selling price and brand value.

A Fuzzy inventory model for demand with constant selling price, ordering cost and holding cost has been developed with fuzzy sense. Trapezoidal fuzzy models are found for profit/Loss. A numerical example is also given in support the theory. A future research is to extend the model under uncertain demand with different profit margins.

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