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Supply Chain Management of Alcoholic Beverage Industry Warehouse with Permissible Delay in Payments using Particle Swarm Optimization

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Abstract: Supply Chain management of Alcoholic beverage industry for Warehouse with Permissible delay in payments using Particle swarm optimization to optimize inventory in the whole Supply Chain of Alcoholic beverage industry. We focus on to specifically determine the dynamic nature of the excess stock level and shortage level required for inventory optimization in the Supply Chain of Alcoholic beverage industry such that the total Supply Chain management of Alcoholic beverage industry for environmental concerns cost is minimized. The complexity of the problem increases when more products and multiple agents are involved in Supply Chain management of Alcoholic beverage industry for environmental concerns process that has been resolved in this work. Here, we are proposing an optimization methodology that utilizes the Particle swarm optimization, one of the best optimization algorithms, to overcome the impasse in maintaining the optimal stock levels at each member of the Supply Chain of management of Alcoholic beverage industry for environmental concerns. We apply our method on four member of Supply Chain management of Alcoholic beverage industry studied model for optimization.
Keywords: Supply Chain management, warehouse, Permissible delay in payments, Particle swarm optimization.

I. INTRODUCTION

Supply Chain management of Alcoholic beverage industry for Warehouse with Permissible delay in payments for Warehouse with Permissible delay in payments using Particle swarm optimization can be defined as “Supply Chain management of Alcoholic beverage industry using for Warehouse with Permissible delay in payments for Warehouse with Permissible delay in payments using Particle swarm optimization can is the coordination of production, inventory, location and transportation among the participants in a Supply Chain management of Alcoholic beverage industry for Warehouse with Permissible delay in payments for Warehouse with Permissible delay in payments using Particle swarm optimization can to achieve the best mix of responsiveness and efficiency for the market being served.”

After a literature review it is realized that there are some flaws in the earlier researches. In the area of integrated inventory models, above-mentioned situations are rarely put together with Supply Chain of Alcoholic beverage industry management of Alcoholic beverage industry for Warehouse with Permissible delay in payments using Particle swarm optimization can. On the other hand, minimization of the cost attracts the attention of few researchers in recent years for the inventory models, but they only considered one side of the Supply Chain of Alcoholic beverage industry, which is either the buyer or the vendor side. As it is mentioned earlier, nowadays integration of entities is really essential in order to be successful in the competitive market in a Supply Chain management of Alcoholic beverage industry for Warehouse with Permissible delay in payments using Particle swarm optimization can. Unfortunately, the researchers who studied the market changes did not concern about this key issue of the Supply Chain management of Alcoholic beverage industry.

Based on all researches and shortcomings mentioned above, this thesis incorporates the integrated inventory model under with products experiencing continuous cost decrease for a successful Supply Chain management of Alcoholic beverage industry for Warehouse with Permissible delay in payments using Particle swarm optimization can of technology-related industries.

There have been a lot of discussions in the existing literature for the possible extension of the basic economic order quantity model to a number of situations where its assumptions are not valid up to now. A business either manufactures the products it sells or it purchases the products it sells from other businesses. In either case, an increase in inventory usually involves a equivalent increase in accounts payable. Raw materials used in the manufacture process are purchased on credit and many other manufacturing costs are not paid for immediately. Products from other businesses are bought on credit. Instead of making immediate cash payment when inventory is increased, a business delays payment, perhaps by a month or so.

Particle swarm optimization is initialized by a population of random solution and each potential solution is assigned a randomized velocity. The potential solutions called particles are then flown through the problem space. Each particle keeps track of its coordinates in the problem space which are associated with the best solution or fitness achieved so far the fitness value is also stored this value is called pbest. Another best value that is tracked by the global version of the PSO is the overall best value and its location obtained so far by any particle in the population. This value is termed gbest.

Thus at each time step the particle change its velocity and moves towards its pbest and gbest this is the global version of PSO when in addition to pbest each particle keeps track of the best solution called nbest or lbest attained within a local topological neighbourhood of the particles the process is known as the local version of PSO.

II. LITERATURE REVIEW

Narmadha at. al. (2010) proposed Multi-Product Inventory Optimization using Uniform Crossover Genetic Algorithm. Radhakrishnan et. al. (2009) gives a inventory optimization in Supply Chain Management using Genetic Algorithm. Singh and Kumar (2011) gives a inventory optimization in Efficient Supply Chain Management. Priya and Iyakutti (2011) proposed Web based Multi Product Inventory Optimization using Genetic Algorithm. Thakur and Desai (2013) a study inventory Analysis Using Genetic Algorithm In Supply Chain Management. Khalifehzadeh et. al. (2015) presented a four-echelon supply chain network design with shortage: Mathematical modelling and solution methods. Kannan et. al. (2010) Discuss a genetic algorithm approach for solving a closed loop supply chain model: A case of battery recycling. Jawahar and Balaji (2009) Proposed A genetic algorithm for the two-stage supply chain distribution problem associated with a fixed charge. Zhang et. al. (2013) presented A modified multi-criterion optimization genetic algorithm for order distribution in collaborative supply chain. Che and Chiang (2010) proposed A modified Pareto genetic algorithm for multi-objective build-to-order supply chain planning with product assembly. Yimer and Demirli (2010) Presented A genetic approach to two-phase optimization of dynamic supply chain scheduling. Wang, et. al. (2011) Proposed Location and allocation decisions in a two-echelon supply chain with stochastic demand – A genetic-algorithm based solution. Humphreys, et. al. (2009) presented Reducing the negative effects of sales promotions in supply chains using genetic algorithms. Sherman et. al. (2010) gives a production modelling with genetic algorithms for a stationary pre-cast supply chain. Ramkumar, et. al. (2011) proposed Erratum to “A genetic algorithm approach for solving a closed loop supply chain model: A case of battery recycling”. Ye et. al. (2010) Proposed Some improvements on adaptive genetic algorithms for reliability-related applications. Guchhait et. al. (2010) presented Multi-item inventory model of breakable items with stock-dependent demand under stock and time dependent breakability rate. Changdar et. al. (2015) gives an improved genetic algorithm based approach to solve constrained knapsack problem in fuzzy environment. Sourirajan et. al. (2009) presented A genetic algorithm for a single product network design model with lead time and safety stock considerations. Jiang et. al. (2015) gives Joint optimization of preventive maintenance and inventory policies for multi-unit systems subject to deteriorating spare part inventory. Dey et. al. (2008) proposed Two storage inventory problem with dynamic demand and interval valued lead-time over finite time horizon under inflation and time-value of money. Jawahar and Balaji (2012) proposed A genetic algorithm based heuristic to the multi-period fixed charge distribution problem. Pasandideh et. al. (2010) gives a parameter-tuned genetic algorithm for multi-product economic production quantity model with space constraint, discrete delivery orders and shortages. Yadav et. al. (2016) proposed a cooperative Two-Warehouse Inventory Model for Deteriorating Items with Variable Holding Cost, Time-Dependent Demand and Shortages. Consider a similar model, Two Warehouse Inventory Model with Ramp Type Demand and Partial Backordering for Weibull Distribution Deterioration. put forward a model, A two-storage model for deteriorating items with holding cost under inflation and Genetic Algorithms. Singh et. al. (2016) proposed a Two-Warehouse Model for Deteriorating Items with Holding Cost under Particle Swarm Optimization. Consider a similar model, A Two-Warehouse Model for Deteriorating Items with Holding Cost under Inflation and Soft Computing Techniques. Yadav et. al. (2016) analyzed a Multi Objective Optimization for Electronic Component Inventory Model & Deteriorating Items with Two-warehouse using Genetic Algorithm. Sharma et. al. (2016) focused an Optimal Ordering Policy for Non-Instantaneous Deteriorating Items with Conditionally Permissible Delay in Payment under Two Storage Management. Yadav et. al. (2016) analyzed a Analysis of Genetic Algorithm and Particle Swarm Optimization for warehouse with Supply Chain management in Inventory control.

III. PREDICTION ANALYSIS ALCOHOLIC BEVERAGE INDUSTRY FOR WAREHOUSE WITH PERMISSIBLE DELAY IN PAYMENTS USING PARTICLE SWARM OPTIMIZATION

The proposed method uses the Particle swarm optimization to study the stock level that needs essential inventory control. This is the pre-requisite idea that will make any kind of inventory control effective. For this purpose, we are using K-mean clustering as assistance. In practice, the supply chain is of length n, means having n number of members in supply chain of Alcoholic beverage industry such as factory of Alcoholic beverage industry, Warehouse of Alcoholic beverage industry, distribution centers of Alcoholic beverage industry, suppliers of Alcoholic beverage industry, Agents of Alcoholic beverage industry and so on. Here, for instance we are going to use a four stage supply chain that is illustrated in the figure 1. Our exemplary supply chain consists of a factory of Alcoholic beverage industry, Warehouse of Alcoholic beverage industry, distribution center of Alcoholic beverage industry and Agents of Alcoholic beverage industry. In the supply chain we are illustrated, the factory is the massive stock holding area where the stocks are manufactured of Alcoholic beverage industry as per the requirement of the Warehouse of Alcoholic beverage industry. The Warehouse of Alcoholic beverage industry is the massive stock holding area where the stocks are manufactured of Alcoholic beverage industry as per the requirement distribution center of Alcoholic beverage industry. Then the distribution center of Alcoholic beverage industry will take care of the stock to be supplied for the Agents of Alcoholic beverage industry. As earlier discussed, the responsibility of our approach is to predict an optimum stock level by using the past records and so that by using the predicted stock level there will be no excess amount of stocks and also there is less means for any shortage. Hence it can be asserted that our approach eventually gives the amount of stock levels that needs to be held in the three members of the supply chain of Alcoholic beverage industry, factory of Alcoholic beverage industry, Warehouse of Alcoholic beverage industry, distribution center of Alcoholic beverage industry and Agents of Alcoholic beverage industry.

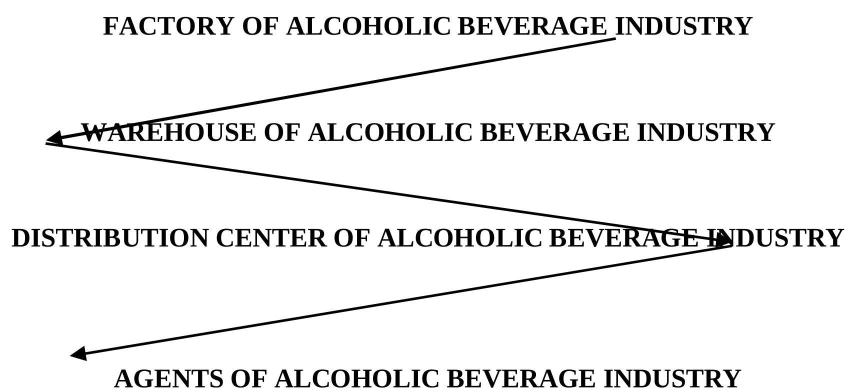

Fig 1. Four Stages Supply Chain of Alcoholic beverage industry

In our proposed methodology, we are for Warehouse with Permissible delay in payments using Particle swarm optimization for finding the optimal value. The flow of operation of our methodology is clearly illustrated, which depicts the steps applied for the optimization analysis. Initially, the amount of stock levels that are in excess and the amount of stocks in shortage in the different supply chain of Alcoholic beverage industry contributors are represented by zero or non-zero values. Zero refers that the contributor needs no inventory control of Alcoholic beverage industry while the non-zero data requires the inventory control of Alcoholic beverage industry. The non-zero data states both the excess amount of stocks as well as shortage amount. The excess amount is given as positive value and the shortage amount is mentioned as negative value.

The first process needs to do is the clustering that clusters the stock levels that are either in excess or in shortage and the stock levels that are neither in excess nor in shortage separately. This is done simply by clustering the zero and non-zero values. For this purpose we are using, the efficient Particle swarm optimization. After the process of Particle swarm optimization is performed, the work starts its proceedings on Particle swarm optimization, the heart of our work.

Inventory Analysis for Warehouse with Permissible delay in payments using Particle swarm optimization Algorithm

1: P: =0
2: $\{M_x, N_x, U_x, V_x\}_{x=1}^{X}$:= initialize()
3: for a:= 1: U
4: for b:= 1: X
5: for r:= 1: R

$n_{xc}^{(a+1)} = yn_{xc}^{a} + c_1 d_1 [V_{xc} - m_{xc}^{a}] + c_2 d_2 [U_{xc} - m_{xc}^{a}]$
$M_x^{a+1} = M_x^{a} + mN_x^{a} + \in^{a}$
end
M_x:= enforce Constraints(X)
Y_x := f(M_x)
if $M_x \npreceq$ e ∀ e ∈ P
P:= {e ∈P/ e$\nprec M_x$ }
P:= P∪M_x
end
end
if $M_x \preceq V_x \vee (XM_x \nprec V_x \wedge V_x \nprec M_x)$
V_x := M_x
end
U_x := selectGuide(X , A)
end

We are using those basic steps for finding the optimal resources for an organization in Medium range prospective using MATLAB software package

IV. IMPLEMENTATION RESULTS

We have implemented the analysis based on Particle swarm optimization for optimal inventory control in the platform of MATLAB. As stated, we have the detailed information about the excess and the shortage stock levels in each Alcoholic beverage industry Supply Chain of Alcoholic beverage industry member, the lead times of product stock levels to replenish each Supply Chain of Alcoholic beverage industry member as well as raw material lead time. The sample data having this information is given in the Table 1.

Table 1: A sample data set along with its stock levels in each member of the Alcoholic beverage industry Supply Chain of Alcoholic beverage industry

TI	F.A.G.I	W.A.G.I	D. 0A.G.I	A. A.G.I
1	7414	6412	5447	4001
2	7825	6854	5534	4512
3	7236	6739	5289	4123
4	7947	6172	5854	4224
5	7558	6295	5113	4835
6	7229	6314	5932	4346
7	7671	6956	5746	4451
8	7185	6761	5328	4967
9	7663	6243	5614	4778
10	7341	6139	5001	4682

The Table 1 is having the Six Stages - 10 Member product ID, the Six Stages - 10 Member Transportation ID, the Six Stages - 10 Member stock levels which are in excess or in Six Stages - 10 Member shortage at each Six Stages - 10 Member Supply Chain of Alcoholic beverage industry member. Negative values represent shortage of Six Stages - 10 Member stock levels and positive values represent the excess of Six Stages - 10 Member stock levels. The Six Stages - 10 Member transportation ID mentioned in table is working as an index in extracting the lead times for Six Stages - 10 Member stocks and Six Stages - 10 Member raw material lead times. Table2 depicts the sample data which is having the Six Stages - 10 Member transportation ID and the Six Stages - 10 Member lead times for Six Stages - 10 Member stocks. For **6** member Six Stages - 10 Member Supply Chain of Alcoholic beverage industry, 17 Six Stages - 10 Member lead times can be obtained.

Table 2: Sample data from Database which is having Permissible delay in payments

TI	F.A.G.I	W.A.G.I	D. A.G.I	A. A.G.I
1	7101	6915	5425	4574
2	7212	6866	5564	4695
3	7303	6747	5443	4786
4	7404	6635	5687	4851
5	7525	6526	5398	4422
6	7636	6464	5765	4013
7	7752	6351	5222	4104
8	7863	6223	5834	4205
9	7974	6134	5176	4326
10	7085	6088	5944	4407

Table 2 depicts the sample data which is having the transportation ID and the Permissible delay in payments. For four member's Alcoholic beverage industry Supply Chain of Alcoholic beverage industry, three Permissible delay in payments can be obtained.
T2 is the Permissible delay in payments involved for movements of the product from F. A.G.I to W. A.G.I;
T3 is the Permissible delay in payments involved for movements of the product from W. A.G.I to D. A.G.I;
T4 is the Permissible delay in payments involved for movements of the product from D. A.G.I to A. A.G.I;

Table 3: Initial random individuals

TI	F.A.G.I	W.A.G.I	D. A.G.I	A. A.G.I
1	1219	-2465	3517	1254
2	1554	2184	3106	-2384

For Particle swarm optimization based analysis, we have to generate random individuals having 17 numbers of particles representing product ID and seven Alcoholic beverage industry Supply Chain of Alcoholic beverage industry members. Table 3 describes two random individuals.
Similarly, Table 4 represents random velocities which correspond to each particle of the individual.

Table 4: Initial Random velocities corresponding to each particle of the individual

TI	F.A.G.I	W.A.G.I	D. A.G.I	A. A.G.I
1	0.1211	0.1512	0.1212	0.1411
2	0.214	0.245	0.254	0.231

The final individual obtained after satisfying the above mentioned convergence criteria is given in Table 5.

Table 5: database format of Final Individual

TI	F.A.G.I	W.A.G.I	D. A.G.I	A. A.G.I
1	1244	-1857	-2368	2389

The final individual thus obtained represents a product ID and excess or shortage stock levels at each of the seven members providing essential information for Alcoholic beverage industry Supply Chain of Alcoholic beverage industry inventory optimization.

V. CONCLUSION

Supply Chain management of Alcoholic beverage industry for Warehouse with Permissible delay in payments using Particle swarm optimization is a significant component Supply Chain inventory management of Alcoholic beverage industry. The novel and proficient approach based on Particle swarm optimization to optimize inventory in Supply Chain management of Alcoholic beverage industry for Particle swarm optimization. we also focus on to specifically determine the complexity in predicting the optimal stock levels and shortage level required for inventory optimization in the Supply Chain management of Alcoholic beverage industry for Particle swarm optimization such that the total Alcoholic beverage industry Supply Chain inventory management of Alcoholic beverage industry cost is minimized .we apply our methods on Alcoholic beverage industry Supply Chain of Alcoholic beverage industry for Particle swarm optimization studied model for optimization. The proposed method was implemented and its performance was evaluated using MATLAB.

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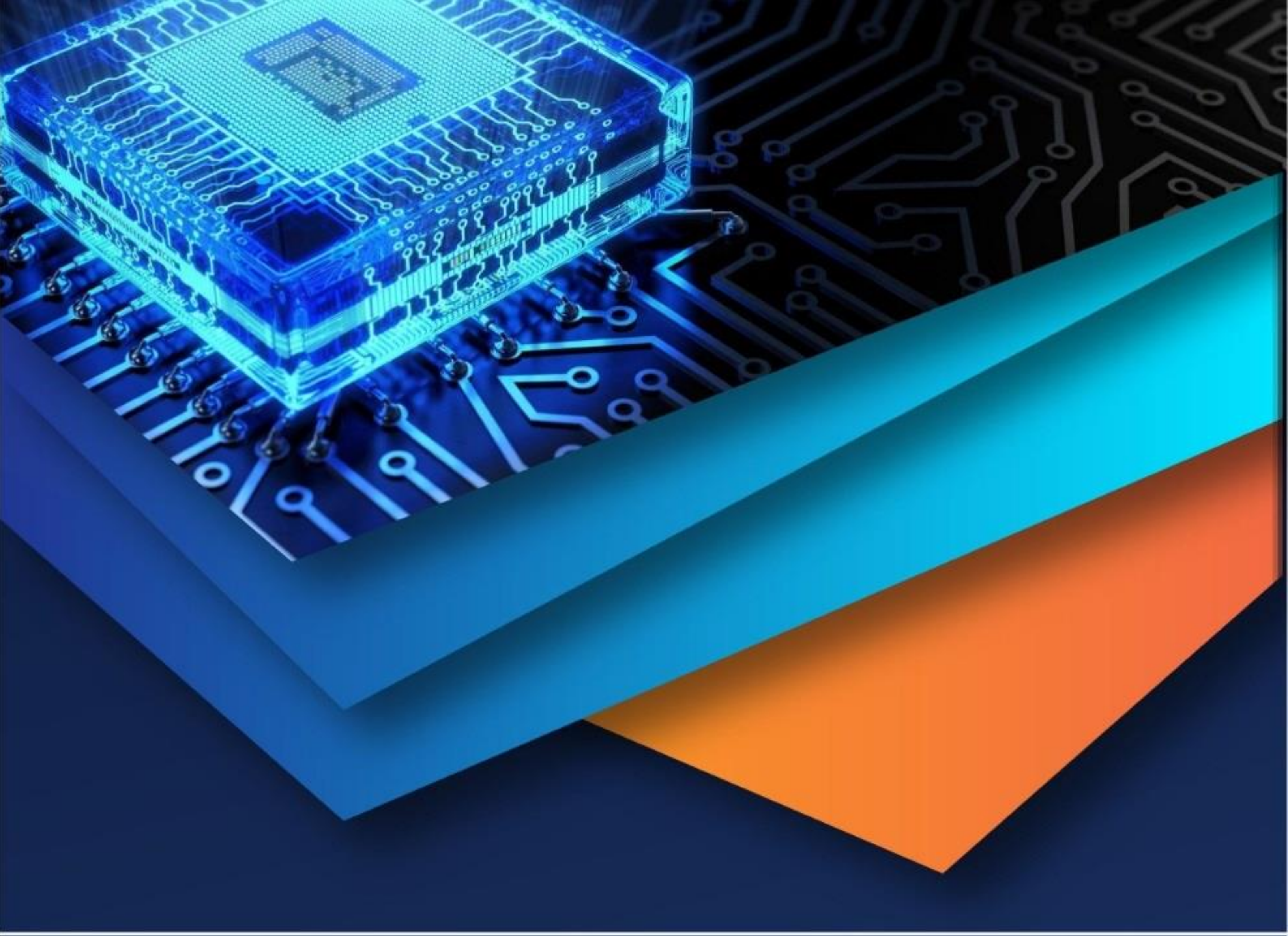

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