Supply Chain Of Chemical Industry For Warehouse With Distribution Centres Using Artificial Bee Colony Algorithm

Ajay Singh Yadav, Jitendra Kumar, Medhavi Malik, Tripti Pandey

Abstract - Chemical industry supply chain management for chemical industry warehouses with environmental concerns A technique based on artificial bee colony algorithm to optimize inventory throughout the supply chain. We focus on determining the dynamics of the overstock and bottleneck levels required to optimize inventory in the supply chain, minimizing the overall supply chain management of the chemical industry in the warehouse. The chemical industry with environmental concerns. The complexity of the problem increases as more and more products and many retailers participate in the management of the chemical industry's supply chain for the chemical industry's warehouse, which resolves the environmental problems posed by this work. Here we propose an optimization method using the Artificial Bee Colony algorithm, one of the best optimization algorithms, to help you overcome the current impasse in order to maintain optimal inventory levels for each member of the chain. supply of the chemical industry. Environmental concerns. We apply our method to four members of the chemical industry supply chain for the optimization model studied by the chemical storage industry.

Keywords: - Supply Chain, Warehouse of Chemical industry, Two- distribution centres, Two-Retailers, environmental collaboration and Artificial bee colony algorithm

1. INTRODUCTION

Supply chain management in the chemical industry can be defined as: "chemical industry supply chain management can be the coordination of production, storage, location and transportation between participants in a chemical industry supply chain management to provide the best combination of responsiveness and efficiency achieve for the market that is served".

According to a review of the literature, previous surveys were found to have some shortcomings. In the area of integrated inventory models, the above situations are rarely associated with supply chain management in the chemical industry. In addition, cost reduction in recent years has only attracted a few researchers for inventory models, but they take into account only one aspect of the supply chain, namely the buyer or the supplier. As mentioned earlier, the integration of entities is essential to succeed in the highly competitive market of chemical supply chain management. Unfortunately, researchers who have dealt with market developments have not addressed this central issue of supply chain management in the chemical industry.

Based on all of the above surveys and deficiencies, this thesis covers the integrated inventory model of products that consistently reduces the costs of effective management of the chemical industry supply chain for industries. related to technology.

Optimization of particle swarms is initiated by a population of random solutions and a random rate is assigned to each possible solution. The solutions called particles then go into the problem space. Each particle follows its coordinates in the problem space associated with the best solution or physical condition obtained, provided that the fitness value is also stored. This value is called p -best. The overall version of the ABCA presents another optimal value, namely the optimal overall value and position obtained by any particle in the population. This value is called g -best.

2. LITERATURE REVIEW

Yadav and Swami (2018) analyzed a integrated supply chain model for deteriorating items with linear stock dependent demand under imprecise and inflationary environment. Yadav and Swami (2018) discuss a partial backlogging production-inventory lot-size model with time-varying holding cost and weibull deterioration. Yadav, et., al. (2018) presented a supply chain inventory model for decaying items with two ware-house and partial ordering under inflation. Yadav, et., al. (2018) proposed an inventory model for deteriorating items with two warehouses and variable holding cost. Yadav, et., al. (2018) analyzed a inventory of electronic components model for deteriorating items with warehousing using genetic algorithm. Yadav, et., al. (2018) discuss a analysis of green supply chain inventory management for warehouse with environmental collaboration and sustainability performance using genetic algorithm. Yadav and kumar (2017) presented a electronic components supply chain management for warehouse with environmental collaboration & neural networks. Yadav, et., al. (2017) analyzed a effect of inflation on a two-warehouse inventory model for deteriorating items with time varying demand and shortages. Yadav, et., al. (2017) discuss an

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inflationary inventory model for deteriorating items under two storage systems. Yadav, et., al. (2017) proposed a fuzzy based two-warehouse inventory model for non instantaneous deteriorating items with conditionally permissible delay in payment. Yadav (2017) analyzed a analysis of supply chain management in inventory optimization for warehouse with logistics using genetic algorithm. Yadav, et., al. (2017) discuss a supply chain inventory model for two warehouses with soft computing optimization. Yadav, et., al. (2016) presented a multi objective optimization for electronic component inventory model & deteriorating items with two-warehouse using genetic algorithm. Yadav (2017) analyzed a modeling and analysis of supply chain inventory model with two-warehouses and economic load dispatch problem using genetic algorithm. Yadav, et., al. 2018 discuss a particle swarm optimization for inventory of auto industry model for two warehouses with deteriorating items. Yadav, et., al. 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Singh, et., al. (2016) analyzed a two-warehouse model for deteriorating items with holding cost under particle swarm optimization. Singh, et., al. (2016) presented a two-warehouse model for deteriorating items with holding cost under inflation and soft computing techniques. Sharma, et., al. (2016) gives an optimal ordering policy for non-instantaneous deteriorating items with conditionally permissible delay in payment under two storage management. Yadav, et., al. (2016) discuss a analysis of genetic algorithm and particle swarm optimization for warehouse with supply chain management in inventory control. Swami, et., al. (2015) analyzed an inventory policies for deteriorating item with stock dependent demand and variable holding costs under permissible delay in payment. Swami, et., al. (2015) presented an inventory model for decaying items with multivariate demand and variable holding cost under the facility of trade-credit. Swami, et., al. (2015) discuss an inventory model with price sensitive demand, variable holding cost and trade-credit under inflation. Gupta, et., al. (2015) proposed a binary multi-objective genetic algorithm &PSO involving supply chain inventory optimization with shortages, inflation. Yadav, et., al. (2015) analyzed a soft computing optimization based two ware-house inventory model for deteriorating items with shortages using genetic algorithm. Gupta, et., al. (2015) discuss a fuzzy-genetic algorithm based inventory model for shortages and inflation under hybrid & PSO. Yadav, et., al. (2015) presented a two warehouse inventory model for deteriorating items with shortages under genetic algorithm and PSO. taygi, et., al. (2015) analyzed an inventory model with partial backordering, weibull distribution deterioration under two level of storage. Yadav and Swami (2014) presented a two-warehouse inventory model for deteriorating items with ramp-type demand rate and inflation. Yadav and Swami (2013) discuss a effect of permissible delay on two-warehouse inventory model for deteriorating items with shortages. Yadav and Swami (2013) analyzed a two-warehouse inventory model for decaying items with exponential demand and variable holding cost. Yadav and Swami (2013) presented a partial backlogging two-warehouse inventory models for decaying items with inflation.

3. PREDICTION ANALYSIS USING ARTIFICIAL BEE COLONY ALGORITHM

The proposed method uses the artificial bee colony algorithm to study stocks requiring substantial management of inventory management in the supply chain through environmental collaboration. This is the basic requirement that makes any kind of inventory control in the supply chain effective through environmental cooperation. To this end, we use the method of the artificial bee colony algorithm as an

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aid. In practice, the supply chain of the chemical industry is long, that is to say it has members in the supply chain of the chemical industry, such as the storage of the chemical industry , the manufacturers of the chemical industry, the chemical industry warehouses, the Wholesaler also includes several retailers but, as indicated in the example, each wholesaler has a retailer. In total, there are two chemical retailers, one chemical-1 retailer for the chemical industry's wholesaling-1, for the chemical wholesale-2, for the chemical retailer- 2-2 for wholesale of chemicals for industry-1 industry. soon. Each retail center also includes several product packages. For example, here we use a six-step, six-step supply chain, shown in Figure 1. Our eight-step supply chain includes a chemical industry warehouse, a chemical industry manufacturer, a warehouse for the chemical industry, wholesale-1 wholesale, wholesale-2, retail-1, chemical industry 2 retailer, product packaging disposal.

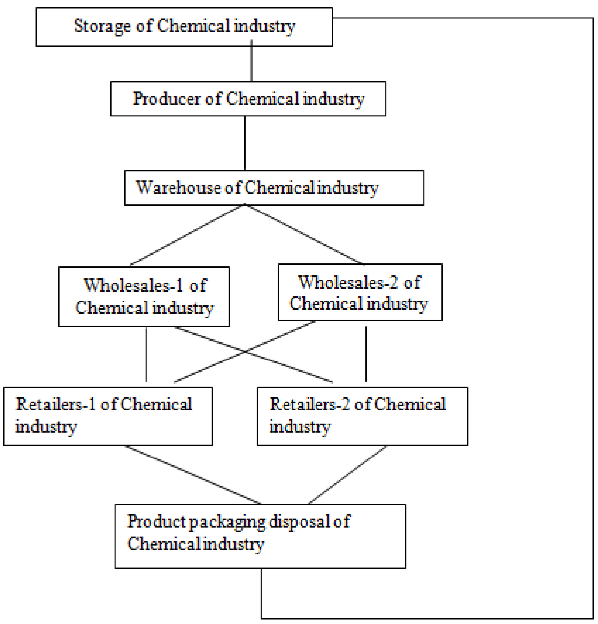

Fig 1. Six Stages - 8 Member Supply Chain

Supply chain inventory control at six levels - eight members shows that the raw material is the large storage area where the chemical industry's storage stock is located. The producer of the chemical industry is the huge warehouse in which stocks are made in accordance with the requirements of the chemical industry warehouse. Then, the chemical industry warehouse takes care of the bulk stock. At wholesalers, the stocks are transferred to the corresponding retailers and finally made available to the product packaging. The stocks are transferred to the corresponding warehouses of the chemical industry. As explained above, our approach is to predict optimal inventory levels from previous registrations, so that the use of planned stocks does not lead to excessive inventory levels and reduced resources. available for the shortage. It can therefore be said that our approach ultimately identifies the amount of inventory needed to manage the supply chain control through environmental cooperation, the storage of the chemical industry, the manufacturers of the chemical industry, the chemical industry, wholesale and wholesale. 1 from the chemical industry, 2 from the chemical industry, 1 from the chemical industry, 2 from the chemical industry. Each wholesale trade includes several retailers but, as shown in the example, each wholesaler has a retailer. In total, there are two chemical retailers, one chemical-1 retailer for the chemical industry's wholesaling-1, for the chemical wholesale-2, for the chemical retailer- 2-2 for wholesale of chemicals for industry-1 industry. Each chemical industry retailer also includes several chemical industry product packages. However, as shown in the example, each retailer has only one product package. In our proposed methodology, we are an artificial algorithm of bee colonies to determine the optimal value.

Which shows the steps for the optimization analysis. Initially, the quantity of inventory exceeded and the quantity of inventory represented by null or non-zero values in the management of the various stocks of the supply chain with the help of personnel of environmental cooperation. Zero means that the contributor does not need inventory control while non-zero data requires inventory control. In non-zero data, inventory and bottleneck are specified. The amount of surplus is shown as a positive value and the amount of the deficit as a negative value.

The first process is clustering, which groups together either above or below stocks and stocks that are neither over nor under-existent. This is done simply by grouping the zero and non-zero values. To this end, we use the efficient algorithm for the artificial bee colony. Once the process of the artificial bee colony algorithm is done, the work begins with the artificial bee colony algorithm, which is at the heart of our work.

This section contains the proposed pseudocode of the hybrid algorithm with the inventory model parameters.

Step 1: Define the parameters of the artificial bee colony algorithm.

Step 2: The bee population is initialized to conserve costs (case 1 for Acceleration Coefficient 1).

Step 3: The bee population is initialized to conserve costs (case 2 for acceleration coefficient 2).

Step 4: Find the quit counter for viewers.

Step 5: For case 1, check the recruited bees from the acceleration coefficient 1.

Step 6: For case 2, check the recruited bees from the acceleration coefficient 2.

Step 7: Create the new solution for bees hired with two cases.

Step 8: If $k \neq i$, then the best solution is.

Step 9: If the new bees cost $\leq$ total population, the cycle = cycle + 1.

Step 10: Find the fitness value of all probabilities.

Step 11: Find the best cost solutions.

The total cost of production and the error must be minimized, which leads to the maximization of the fitness function

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4. IMPLEMENTATION RESULTS

We implemented analysis based on the artificial bee colony algorithm to ensure optimal inventory control on the MATLAB platform. As noted above, we have detailed information on stocks for excess stocks and insufficient shipments in each member of the supply chain, delivery times of product stocks to replenish each member of the supply chain. supply and supply deadlines for raw materials. Examples of data containing this information are given in Table 1.

Table 1: An example of a dataset with its inventories in each member of the supply chain

TI	S	P	W	WS-1	WS-2	R-1	R-2	PPD
1	05	15	20	05	70	05	40	50
2	10	10	21	10	71	41	41	10
3	15	15	21	15	75	45	41	50
4	20	10	22	20	72	40	42	20
5	25	15	22	25	25	45	42	50
6	30	10	23	30	70	40	43	30
7	35	15	23	73	75	45	43	50
8	40	10	24	70	74	44	44	40
9	45	15	24	75	74	45	44	50
10	50	10	25	70	75	40	40	70

Table 1 contains the product of chemical industry identification, transportation identification and chemical industry inventories, which exceeds or exceeds the chemical industry of each member of the supply chain. 'chemical industry. Negative values indicate a shortage of stocks in the chemical industry and positive values for stock levels. The transport identifier mentioned in the table is used as an index to determine the delivery times for stocks and the raw material for the delivery time of the chemical industry. Table 2 shows the examples of data with the transport identifier and the lead times for chemical industry stocks. Six delivery times can be achieved for the supply chain of seven people from the chemical industry.

Table 2: Examples of database data with lead times for stocks

TI	S	P	W	WS-1	WS-2	R-1	R-2	PPD
1	11	21	13	31	21	83	83	93
2	11	21	14	41	21	84	84	94
3	31	81	11	25	21	51	81	95
4	25	61	16	26	61	86	81	96
5	45	31	17	27	71	87	87	97
6	31	36	18	28	81	88	81	98
7	51	39	19	29	91	89	91	99
8	41	71	20	30	30	80	81	90
9	51	40	21	31	11	81	11	91
10	71	41	22	32	31	82	81	92

Table 2 shows the sample data with transport ID and lead times for stocks. Six processing times can be obtained for the seven-person supply chain.

T1 is the turnaround time for product movements in the chemical industry from S to P

T2 is the lead time for chemical industry product movements from P to W;

T3 corresponds to the transport time of the product of the chemical industry from W to WS-1.

T4 corresponds to the transport time of the product of the chemical industry from W to WR-2.

T5 is the product transfer delay of the chemical industry from WS-1 to R-1;

T6 is the transportation time of the chemical industry product from WS-1 to R-2;

T7 corresponds to the transport time of the product of the chemical industry from WS-2 to R-1;

T8 corresponds to the transport time of the product of the chemical industry from WS-2 to R-2;

T9 is the transportation time of the chemical industry product from R-1 to PPD.

T10 is the transportation time of the chemical industry product from R-2 to PPD.

During the initialization step of the ABCA process, the random individuals and their corresponding speeds are generated.

Table 3: Initial Random Persons

TI	S	P	W	WS-1	WS-2	R-1	R-2	PPD
1	725	347	454	425	425	854	854	-10
2	654	515	357	-534	-534	465	465	50

For ABCA based analysis, we have to generate random individuals having 10 numbers of particles representing product ID and seven supply chain of Chemical 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	S	P	W	WS-1	WS-2	R-1	R-2	PPD
1	0.25	0.54	0.22	0.45	0.65	0.25	0.58	0.59
2	0.54	0.75	0.74	0.31	0.33	0.38	0.38	0.30

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

Table 5: database format of Final Individual

TI	S	P	W	WS-1	WS-2	R-1	R-2	PPD
1	32	-98	-53	83	63	13	-60	21

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 supply chain inventory optimization of Chemical industry.

5. CONCLUSION

Chemical industry supply chain management for the chemical industry warehouse using the artificial bee colony algorithm is an integral part of supply chain inventory management of the chemical industry. The innovative and competent approach relies on an artificial bee colony algorithm to optimize stocks in the eight-level supply chain management of the chemical industry, with six members for the chemical industry warehouse. We also focus on determining the complexity of forecasting optimal stock levels and stock optimization bottlenecks in supply chain management in 8 steps out of 8 for the chemical sector, so that overall storage costs in the supply chain are costly. the chemical industry is minimized. We apply our methods to supply chain management in 8 steps and 6 steps in the chemical industry. A model for optimizing environmental cooperation has been studied. The proposed method was implemented and its performance was rated MATLAB.

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