

Research on the Construction of China's Tobacco Lean Logistics "1434" Application System

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Abstract: Based on the theory of lean logistics, it is discussed on the application system about the lean management of tobacco logistics, combined with the development characteristics of logistics in Chinese tobacco industry. The main contents include: on the basis of the development status and basic characteristics of logistics in Chinese tobacco industry, analyze the lean logistics management how to enhance the value of Chinese tobacco industry, put forward the "three outlooks" principle of the lean logistics development in the tobacco industry-set up the service of values by "meet customer demand" as the core, adhere to the outlook on process by "flow of value" as the core and emphasize the outlook on development by "continuous improvement and technological logistics" as the core, then use them as the guidance to construct the "1434" application system of lean logistics in the tobacco industry which is composed of the "one main line, 'four' operating mechanism, 'three' supporting mode and 'four targets' in the industry of lean logistics"; analyze the connotations about these elements and the internal correlation among these elements in the "1434" system of lean logistics, then be discussed on the implementing architecture of the "1434" application system."1434" Lean Logistics Application System is applied to logistics management for China municipal tobacco monopoly bureau (company), the effect was analyzed. Results show that "1434" Lean Logistics Application System can effectively reduce logistics cost, improve logistics efficiency and the service level. Effectiveness and practicability of "1434" Lean Logistics Application System are demonstrated when improving the tobacco industry logistics management level, and has a certain guiding role on the lean logistics construction of China's tobacco industry.

Keywords: Lean logistics, Chinese tobacco industry, Application system, Operating mechanism, Supporting mode

1. INTRODUCTION

In recent years, the development of China's tobacco industry is facing the grim situation of dual pressure at home and abroad, where the expansion and penetration of international tobacco giants should be resisted, the fierce market competition with domestic logistics company with high-speed development should be made. Facing the new situation, China tobacco monopoly bureau put forward to enhance the irreplaceability of tobacco logistics in China in 2010. "The irreplaceable modern logistics system for the future comprehensively constructed". In the new development stage of modern logistics construction for tobacco industry, based on the actual demand of improve the the cigarette construction, combining with the characteristics of the tobacco industry logistics management, according to the request of comprehensive construction of irreplaceable modern logistics system, adhere to the

development direction of technological logistics, use the advanced modern logistics theory and technology, set up modern and practical modern logistics system and strongly effective operation mode, speed up the pace of the modern logistics construction of tobacco industry, create enough industry logistics advantage, and they are a major issue for current China's tobacco industry.

The lean logistics is an important development direction of the domestic and international construction of modern logistics system. In recent years, it, an advanced mode of commercial marketing, logistics and distribution and business management, has been attracted various industries' attention. It's an important path to upgrade the management level of modern logistics and achieve the target "the upper level of cigarette" in the tobacco industry which put the theory of lean logistics into the logistics management of tobacco commercial enterprises, construct the theoretical system of lean logistics to meet the actual demand of the development of tobacco commercial enterprises, realize the logistics value-added through continuous exploration of lean development model of integrating resources, optimizing processes, strengthening management and increasing the level, and then make the logistics become "the third fountainhead of profit" in addition to reduce consumption and put up labor productivity in the tobacco industry.

2. THE ANALYSIS OF PRESENT SITUATION AND BASIC FEATURES FOR CHINA'S TOBACCO INDUSTRY LOGISTICS

2.1 The Present Development Situation for China's Tobacco Industry Logistics

Chinese tobacco logistics is roughly divided into three stages since the foundation of the state. The first stage is belonged to commercial circulation pattern under the planned economy in the 1980s. The second phase is in the late 1980s to 1990s, tobacco logistics shift from the commercial circulation to marketing circulation. The third stage is the modern logistics development in the 21st century

At present, modern logistics construction of China's tobacco industry has made significant achievements. The cigarette logistics distribution system whose main body is commercial enterprise has been basically perfected. Positive progress was made in industrial enterprise logistics construction. Integration of industry and commerce logistics construction has a new breakthrough. Logistics basic work is further strengthened. As of May 2010, cigarette industry distribution system has more than 356 distribution centers all over the country, 1102 station, 1276 the cigarette sorting line, 15027 delivery vehicles, 40722 distribution lines. Logistics management level is improved continuously, provincial bureau (company) give full play to the regulatory functions of logistics, insist construction as well as management. Prefecture-level companies made progress in system construction, resource integration, circuit optimization, cost control, performance management, service improvement, etc. Service, cost, and efficiency are given more attention in the industry logistics management. Logistics enterprises at all levels actively carry out the job of evaluation and benchmark. The logistics performance evaluation system is established and improved. Business logistics has entered the elaborating management stage.

1.2 The Basic Characteristics of China's Tobacco Industry Logistics Management

1) The demand characteristics of China's tobacco industry logistics

The tobacco industry logistics mainly refers to commercial cigarette logistics, which is the core of tobacco circulation value. At present, demand characteristic of China's tobacco business logistics mainly reflected in the following aspects: total cigarette demand is big, and increasing; the number of cigarette retail customers is numerous, which has wide spatial distribution; cigarette demand characteristics is diversification of varieties, small batch, high frequency and short cycle. Seasonal demand fluctuation is large.

2) Circulation characteristics of China's tobacco industry logistics

At present,China tobacco mainly adopted the management system in which industry and commerce are separated.Commercial tobacco logistics presents obvious regional circulation characteristics. Due to local protection, most of the sales of the enterprises are completed in the local province.Therefore,tobacco business logistics in each province is focused on the area itself.The regional logistics characteristics is presented the relatively stable characteristics in flow direction, flux and flow rate.

3)Storage characteristics of China's tobacco industry logistics

As the strict monopoly control for cigarette production and sales,it belongs to the planned economy mode.At the same time,the demand of the market is constantly changing,and there is no way to control,which leads that plan didn't change quickly.Therefore,in the process of China's tobacco circulation,there exists the problem that inventory cycle is too long.which dues to the great amount of tobacco logistics warehouse.

4)China's tobacco business logistics distribution characteristics

In the restrict of the basic properties, high added value and monopoly protection feature,tobacco distribution should follow limit control(national interests and consumer interests),time-limited service(on overnight delivery) ,quality assurance(quality check and code certification),safe transport,legal operation, etc.

5)The technical features of China's tobacco industry logistics

In the aspect of information technology,tobacco production enterprise presents highly automated production.Therefore,when linked to the tobacco circulation enterprises,it should possess function of real-time,accurate, tracking and control,which requires tobacco logistics should be in the direction of high information.

6)The characteristics of the China's tobacco industry logistics management

China's tobacco industry is in transition from traditional business to market circulation.China's tobacco industry logisticsadopts 3-Level management and 4-level operation system:China National Tobacco Company (CNTC),Tobacco regional logistics distribution center,Municipal-scale tobacco logistics distribution center.China National Tobacco Company (CNTC) is responsible for the establishment of hardware and software standards, and the overall logistics operation mode of the whole system. It is the hub of macro management decisions for industry logistics.Tobacco companies in each province,autonomous region and municipality directly under the central government can take the relatively independent logistics operation. Tobacco logistics distribution center of the city local tobacco companies and cigarette manufacturing enterprise give priority to the local logistics activities,and there's no cross-regional logistics activities.

3.THE ESSENTIAL FRAMEWORK OF "1434"APPLICATION SYSTEM BASED ON THE "THREE OUTLOOKS"THOUGHT OF LEAN LOGISTICS IN THE TOBACCO INDUSTRY

Based on the fundamental theory of lean logistics, combined with the status and characteristics of logistics management in Chinese tobacco industry and established in the systematicness and practicability, the paper puts forward and constructs the "1434" application system of lean logistics' development and construction of tobacco commercial enterprises. The structure of application system as shown in Figure 1 is composed of a main line, four kinds of operation, three kinds of support and four targets.

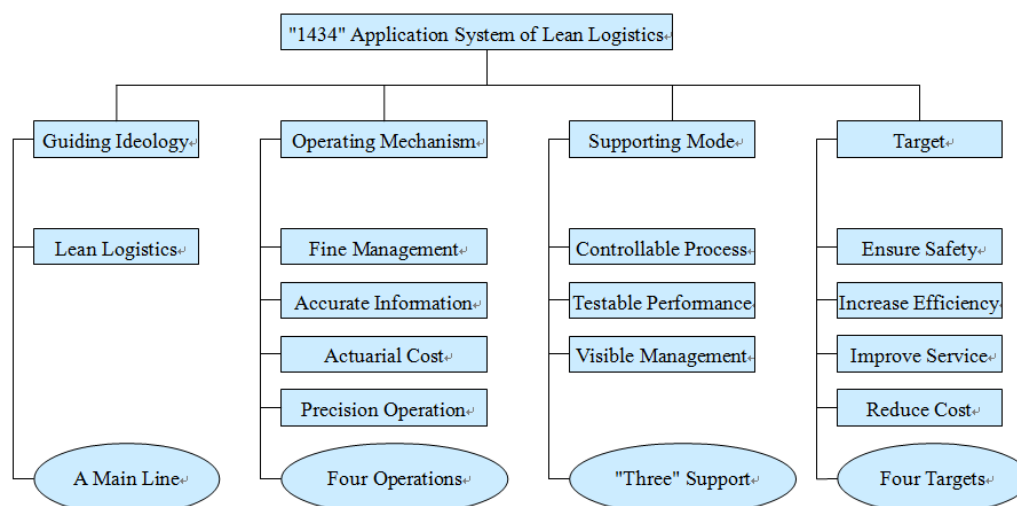


Figure 1.the basic composition of the "1434" application system of tobacco commercial enterprises' lean logistics

1) A main line: grasp "the ideas of lean logistics management". Set up the lean logistics' service of values by meeting customer demand as the core and the guiding ideology by the industry's lean logistics management as the construction of application system. Raise the cognitive level and grasping ability of whole industry to develop and construct the tobacco lean logistics. Be fully aware that it's the essence of modern logistics that the circulation create service of values and the construction of lean logistics is an important path to develop tobacco's modern logistics and enhance industry's irreplaceably core competitiveness during the new period and new stage. Earnestly seize the scientific decision-making and implementation of all aspects including the industry characteristics, overall planning objectives, hierarchy construction and implementation of operating management, etc. about the development and system construction of tobacco lean logistics.

2) Four kinds of operation: establish "four" operating mechanism including "fine management, accurate information, actuarial cost and precision operation". Adhere to the lean logistics' outlook on process by "flow of value" as the core. Perfect, optimize, improve and reconstruct the value chain of fine management' organization, the value chain of accurate information's flow, the value chain of actuarial cost's (cash flow) management and the value chain of precision operation's process about the industry's logistics by using customers' (market) demand (orders) to drive (pull) the flow of value as the core. Establish the scientific application system of value chains and the operating mechanism about the industry's lean logistics. Achieve the excellent process management based on systematic value flow and provide services of lean logistics to meet consumers' demand in the most economic and the most agile method.

3) Three kinds of support: build "three" supporting mode including "controllable process, testable performance and visible management". Emphasize the lean logistics' outlook on development by "continuous improvement and technological logistics" as the core. Apply the advanced technology and method including the demand-pull logistics control, the excellent performance management and the visualization of logistics information, etc. by the lean controllable process, the lean testable performance and visible management information as the cuts. Construct the application mode base on the demand-pull lean controllable process, the application mode base on the data-transfer visualization of logistics management and the application mode base on the dynamically cyclic lean testable performance. Then, promote speedily the management level of lean logistics in the industry through the continuous

improvement, reconstruction and optimization of process and the innovation of management mechanism and technological method.

4) Four targets: Realize to improve service, increase efficiency, ensure safety and reduce cost. Pursue to achieve the requirement of overall target "the upper level of cigarette" in the lean logistics. Through implementing the construction of application system of lean logistics, pull the improvement of service quality, increase work efficiency, reduce cost, ensure security and achieve a comprehensive quality management of modern logistics in the tobacco industry.

4.THE ANALYSIS OF INTERNAL STRUCTURE OF "1434"APPLICATION SYSTEM OF LEAN LOGISTICS

The "1434" application system of Lean logistics, in accordance with implementation of functions, can be divided into three levels including the target layer, operation layer and support layer, as shown in figure 2.

Using Anylogic simulation software, the simulation equipment change, the specific situation of streamline , make corresponding plan, deposited in the plan in the library. When there is a situation occurs, the contingency plans in the library can find out the corresponding plan. If the plan in the library does not, it can be drawn by running the Anylogic software. Finally, in decision support advice, we can find the corresponding decision help. Specific research process is as shown in Figure 2.

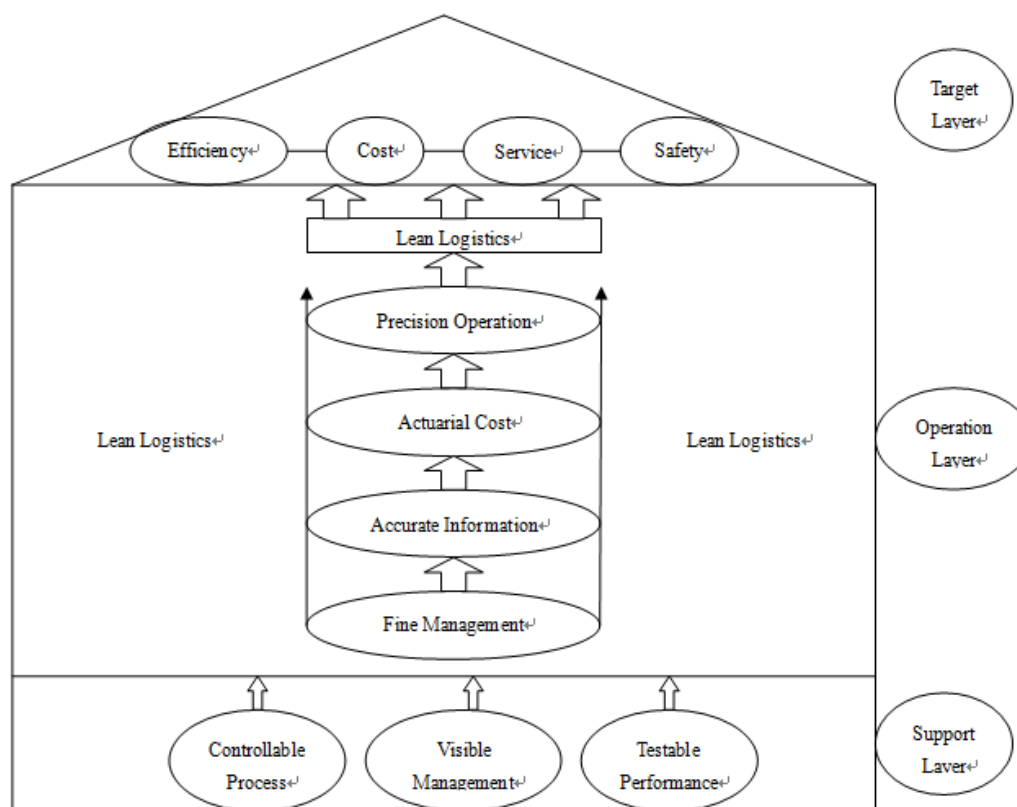


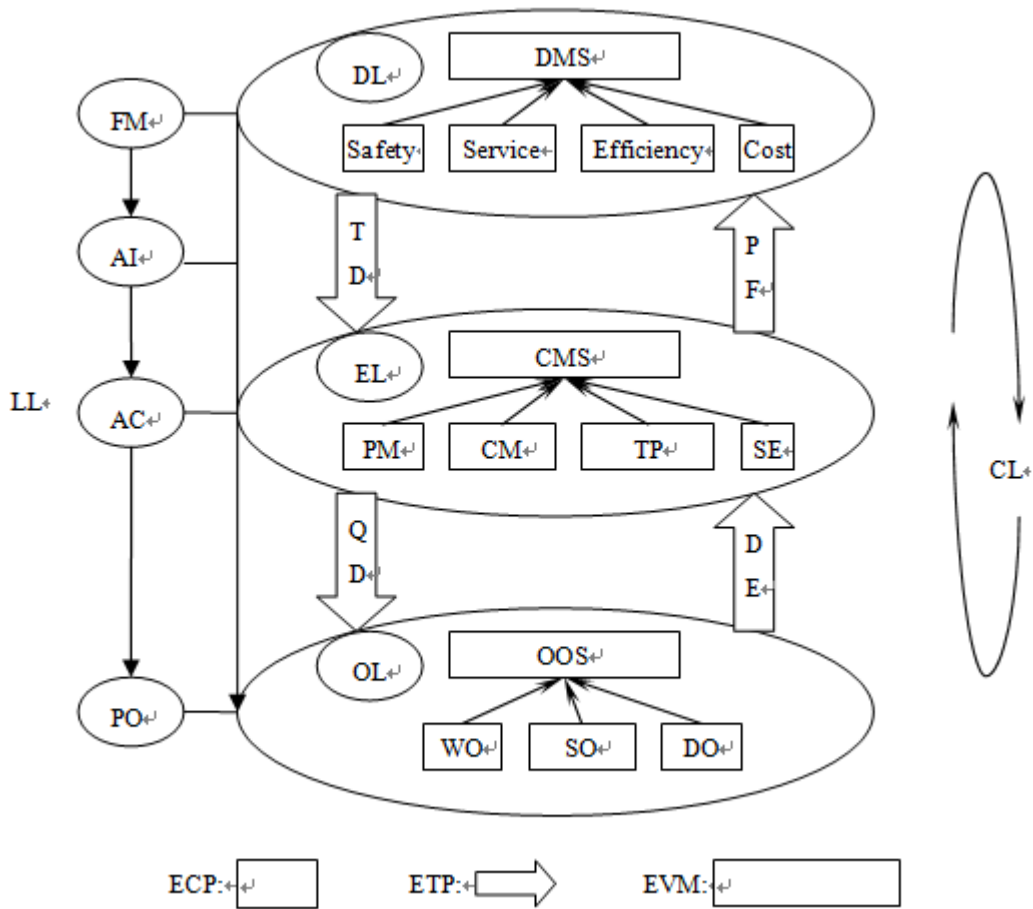
Figure 2.the structure of "1434" application system of lean logistics

The main line, grasping "the ideas of lean logistics management", throughout all levels of the application system, is the soul and basic guarantee to achieve the application system. Hereinto, the target layer is mainly aimed at four targets of the upper level of comprehensive quality management in the tobacco industry, is the target system to realize the application system of lean logistics, is the comprehensive show on the highest level of requirements of lean logistics' construction; the operation layer is "four" operating mechanism, is the method system to realize the application system of lean logistics, is a central operating element and

important mean to realize the target of lean logistics' construction, is well versed in the lean logistics' values by the propulsion "fine management→ accurate information→ actuarial cost→ precision operation→ lean logistics"; the support layer is "three" application mode, is the technology system to realize the lean logistics' application system, is the vital technical support to realize the target of lean logistics' construction and "four" operating mechanism, is the ultimate embodiment on "four" operating value.

5.THE ANALYSIS ON THE ACCOMPLISHED ARCHITECTURE OF "1434"SYSTEM OF TOBACCO LEAN LOGISTICS

Establish an overall framework of "1434" application system of lean logistics for tobacco commercial enterprises around "three" supporting mode, as shown in Figure 3.



Decision-making Management Signboard: DMS	Fine Management: FM
Comprehensive Management Signboard: CMS	Accurate Information: AI
On-site Operation Signboard: OOS	Actuarial Cost: AC
Decision-making Layer: DL	Precision Operation: PO
Executing Layer: EL	Lean Logistics: LL
Operating Layer: OL	Control Loop: CL
Process Monitoring: PM	Targets Down: TD
Cost Management: CM	Performance Feedback: PF
Testable Performance: TP	Quotas Distribution: QD
Service Evaluating: SE	Data Extraction: DE
Warehousing Operation: WO	Elements of Controllable Process: ECP
Separating Operation: SO	Elements of Testable Performance: ETP
Distributing Operation: DO	Elements of Visible Management: EVM

Figure 3. the accomplished architecture of "1434" application system of lean logistics for tobacco commercial enterprises

This architecture, in accordance with object-oriented visualization of management, can be divided into three levels including the decision-making layer, executing layer and operating layer. It fuses and reflects very well "four kinds of operation", "three kinds of support" and "four targets" which are well versed in the "1434" application system.

Introduce the mode of signboard management, carry out the management and monitoring of on-site operation, the transfer and sharing of logistics data and the data query, analysis and statistics, etc. through the logistic management information system and set respectively the decision-making management signboard, comprehensive management signboard and on-site operation signboard. Then show respectively the senior managers, middle managers and on-site operating personnel the related logistic management information by the specific forms of data, text description, statistical chart, report form, voice prompt, image transmission and dynamic information and realize the visual management.

Hereinto, the decision-making layer realizes visual management mainly through the decision-making management signboard, uses the visual management of "four targets" of "1434" system as the main content, makes policymakers grasp macroscopically the overall operating situation of logistics distribution center through showing the calculating results of quantitative quotas and the evaluating results of qualitative quotas to the policymakers and timely makes a decision to adjust the abnormal information.

The executing layer, mainly through its management signboard, uses process monitoring, cost management, testable performance and service evaluating as the content of visual management and adopts the method and technology of key nodes control and early warning management to set three grades which is the red light meaning alarm, the yellow light meaning early warning and the green light meaning normal according to different situations. When taking on the red or yellow conditions, the system automatically prompts. Then the executing layer can find problems in time, analyzes from layer to layer, dig problems into the fundamental reason and provide the basis for the improvement of work and the promotion of logistics level.

The operating layer, mainly through on-site operation signboard, conveys information—marques, brands, order information, customer information, time, number, operator information, a link of information and the next link of information, etc. It makes operators stick out a mile the link and sequence of logistics distribution and be clear about links of progress, a link of inventory and scheduling and staffing situations, etc.

6.INSTANCE ANALYSIS

With the background of a Municipal tobacco monopoly bureau(Company) in China,the "1434" Lean Logistics System is applied into the logistics management of the company and the applied effect is verified.The kinds of cigarettes that the company sales is 37 and the standards is 125.The numbers of total retail customers which the company distribute cigarettes for is 16224 and the numbers of the direct customers is 6889 and the numbers of the indirect customers is 9335.There are 108 distribution routes and 33 distribution vehicles in the company.In 2011,the company distributed 182000 cases of cigarettes.

Through the analysis of the cigarette logistics development status of the company, there is a certain margin between the levels of the existing comprehensive logistics management and the lean logistics requirements. The same with the majority of the country's municipal companies, the company is in the transformation stage from the scale of extensive type to systematic lean type. After the implementation of the "1434" lean logistics system, by focusing on building the "three can" support mode in which lean process control, performance lean assessment and management information can be regarded as the breakthrough points, application of the advanced technologies and methods such as demand-driven logistics control, performance excellence management and logistics information visualization, building lean control application process model based on demand-driven, application mode of logistics management visualization based on data flow and detailed implementation scheme of the lean performance test application mode based on dynamic circle, by improvement, reengineering and optimization of the processes, innovation of management mechanism and technical application methods, the company greatly improved its levels of lean logistics management and achieved remarkable success: In the first year of the implementation of "1434" lean logistics system, the total cost of logistics of the company dropped 35%. Its overall efficiency and customer satisfaction respectively increased 25% and 20%. At the same time, the management level of the logistics safety also had an great increase, such as levels of payment, logistics equipment and emergency management.Table-1 is the situation of logistics costs before the implementation of "1434" lean logistics application system.

Table1. logistics cost of one company

Cost category	Unit of measurement	The value of cost
Single cases of logistics cost	Yuan/case	138.23
Single cases of warehouse and sorting cost	Yuan/case	14.74
Single cases of distribution cost	Yuan/case	82.61
Single cases of management cost	Yuan/case	4.089
Logistics cost rate	-	0.75%
Logistics cost profit rate	-	2178%

Figure4. shows that the variation's situation of the logistics cost of the company. With the Three-Feasible Model,these key indexes such as Single cases of logistics cost, Single cases of distribution cost, Single cases of management cost ,which reflect logistics cost of the company,will present the declining tendency with the change of time and will become steady gradually where these indexes become good.The exception in the figure-8 is caused by the some special reasons.

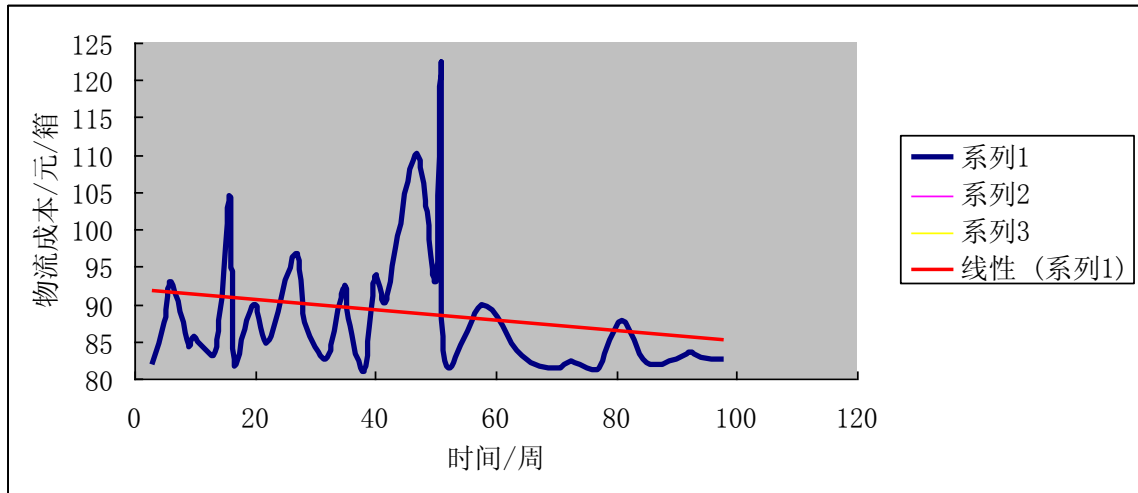


Figure4. tendency analysis of logistics cost

Figure5. records unit cigarette mean cyclic time and total cyclic time of some operation procedures that include putting into storage, sorting and distributing. Figure-10 shows unit cigarette mean waiting time and total waiting time of these operation procedures. The four kinds of colours represent information of four months from left to right in these figures. From these figures, both the cyclic time and waiting time are declined in these months.

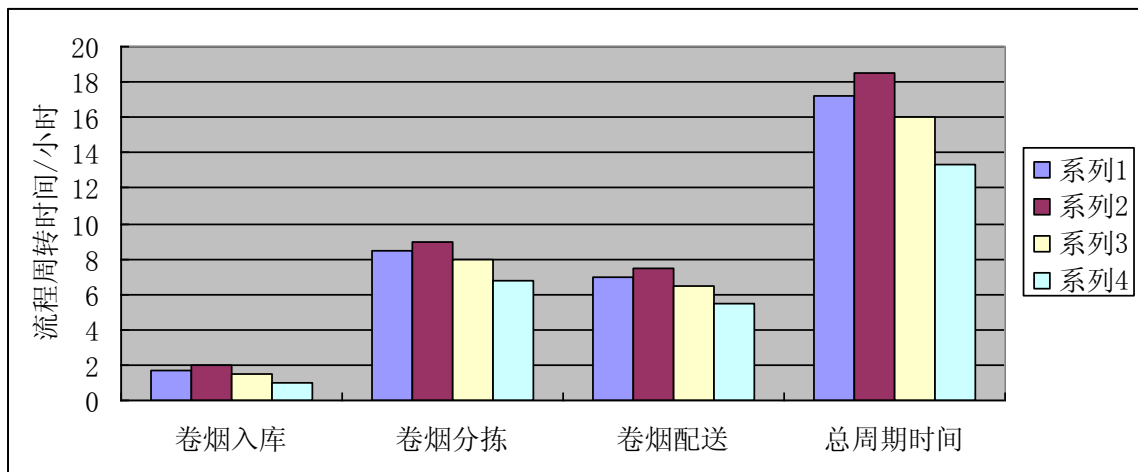


Figure5. the cyclic time of main logistics procedures

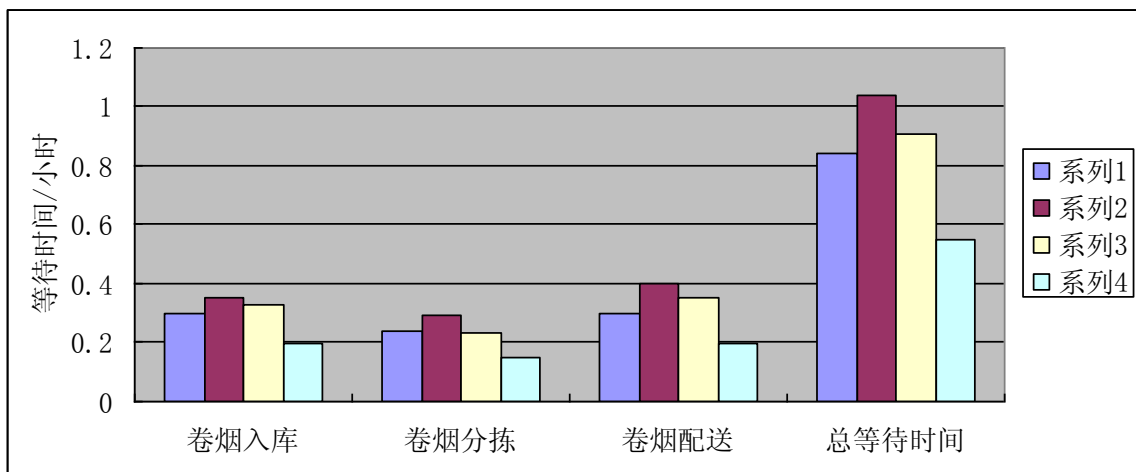


Figure6. the waiting time of main logistics procedures

Figure7. records the variation tendency about some key indexes such as availability of

affordability, reliability, rapid responsiveness and speciality, which indicate service satisfaction about the company. These results show that the service level of logistics is lifting substantially and client satisfaction is presenting upward tendency after "1434" Lean Logistics System is applied into the company.

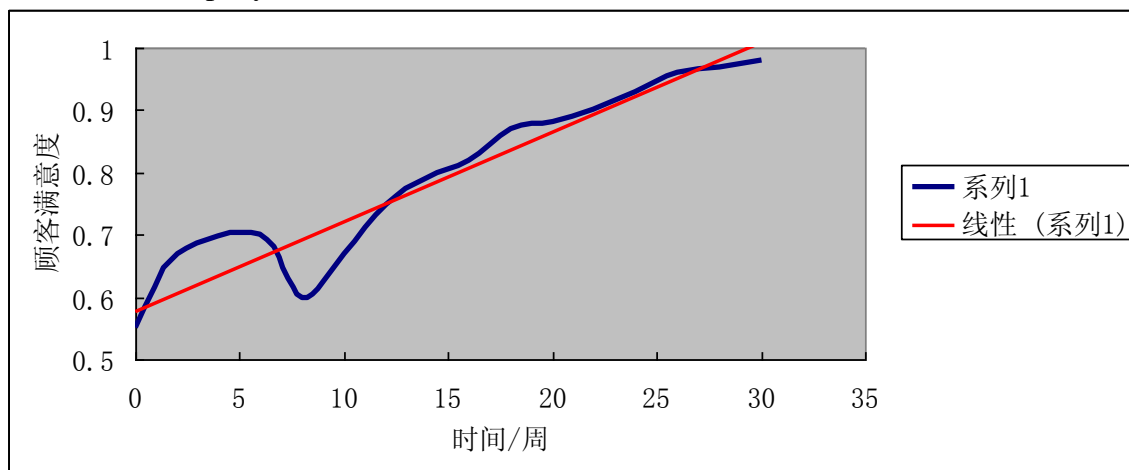


Figure7. the tendency of client satisfaction

Figure1. development process of management decision support system of passenger organization for Large passenger railway station

It follows that with "1434" Lean Logistics System is applied into the company properly, the operating state of logistics procedures in the company is steady, the level of logistics management is good, the phenomenon of waste almost disappears, logistics cost is declined validly, both the logistics efficiency and service level are improved, all the flow of fund flow, information flow and material flow are reasonable and the integral level of logistics management in the company is promoted. These results indicates that "1434" Lean Logistics System is viable and practical.

5. Conclusion

This paper, directed against the trend of development in the theory of modern logistics and the demand of development in the construction of modern logistics about Chinese tobacco industry, combined with the property and the characteristics of goods in the tobacco industry, constructs the "1434" application system of lean logistics suited to the development of modern logistics in Chinese tobacco industry, proposes the framework of lean logistics' application system which is composed of the "one main line, 'four' operating mechanism, 'three' supporting mode and four targets" and constructs the accomplished mode of "1434" application system by the "three kinds of support" as the main content in order to provide the basis for the establishment and implementation of lean logistics system in tobacco commercial enterprises. In view of the construction of modern logistics which is still in the development phase in the tobacco industry, it's still difficult to establish the comprehensive and complete application system of lean logistics. It's a direction in the further efforts in this paper from now on to further improve the content and accomplished mode of "1434" application system of lean logistics in tobacco commercial enterprises by continuing to deepen the study of lean logistics' theory and cognition of logistics in the tobacco industry.

6. References

Martin Christopher. The agile supply chain : competing in volatile markets[J]. *Industrial Marketing Management*, 2000, 29(1) : 37~44

Helmut Baumgarten, Christian Butz, Ailnerose Fritsch, etc. Supply chain management and

reverse logistics-integration of reverse logistics processes into supply chain management approaches[J]. *Electronics and the Environment*,2003, 22(1) : 79-83

Hokey Min,Gengui Zhou. Supply chain modeling : past,present and future[J]. *Computer&Industrial Engineering*, 2002, (43) : 23 1-249

Douglas J. Thomas, Paul M. Griffin. Coordinated supply chain management[J]. *European Journal Operational Research*, 1996, 94(1) : 1~15

Richard Lamming. Beyond partnership : strategies for innovation and lean supply[M]. *New York : Prentice Hall*, 1993

Yang Lijun, Zhang Dan, Deng Xudong. Study on the implementing lean logistics of enterprises [J]. *Popular Science & Technology*, 2006, (8):158~159

China Tobacco E-commerce Co. Ltd. etc. The modern logistics management in tobacco commercial enterprises [D]. *Jinan: Shandong University press*, 2011

Yang Bo. The research on the theory and method of lean logistics management [D]. *Wuhan: Wuhan University of Technology*, 2002

Lu Wei. The characteristics and difficulties about automotive purchasing and supply logistics [J]. *Logistics Technology and Application*, 2008, (9):75~79

Xuan Chunxia, Wei Dapeng. The wide manufacturing industry calls lean logistics [J]. *China Economist*, 2004, (5):13~14