

Introduction of Lean Management at NAGÉV RÁCS Ltd

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Abstract: Introducing lean management enterprises can improve significantly the efficiency of logistics and supply chain management and their profitability. The study discusses, using the results of a survey, the experiences and lessons learned from the implementation of lean management at NAGÉV RÁCS Ltd. At the beginning (March 2016) lean improvement assessment was performed, then lean development program was planned which effect was measured later (October 2016). Fifteen areas of the lean progression were quantified and analyzed during the time period identifying new aims and suggestions for the future.

Key words: Lean assessment, supply chain, process improvement.

1. Introduction

For many multinational companies an important development possibility of logistic and supply chain processes is to apply lean management. The main aim of the lean management is to remove the wastes from the production and service processes. The Toyota Company identified seven types of wastes; one of them is inventory which is the one of the basic problems of logistic literature.

The 2008-2009 world economic crises had a long-term impact on both businesses and people. It created a situation that was ideal for introducing the lean management.

This company organization system is now familiar to all manufacturing companies, many of them started to introduce the lean, but this was successful only for companies fighting for survival. Many firms begin to adopt the “lean management” according to the trends, though they should start the first step by reforming their thinking. The lean introduction should be started, to understand the basics and reasons why changes are needed, and make the members of the organization be motivated.

The NAGÉV RÁCS Ltd. was unsatisfied with the

quick, but non-durable, short-term solutions therefore the company started a paradigm shift at the end of 2014. Recognizing the importance of human resource development, education and lifelong learning, the year of 2015 became the year of education at the company. The development of human resources always poses a great risk, but in the long run, the most valuable resource of the firm is the trained and loyal workforce. By the end of 2015 the company started to change its mindset. Since not only the perfecting of production was the goal, therefore the lean approach was chosen as the method of development. Engaging the employee in the company’s operation was as important as it was incentive, motivation, and self-organization which are in the core of the lean management. Finally, there is a management tool, where profit maximization is not just the only that matters, but the most important issues coming into view are: customer, value for customers, and the value creating people and processes. Introducing a challenging, new and complex system can always encourage members of the organization; however there is no change without resistance.

2. Evaluating Lean Implementation at the Company

Organizations need a proper measuring tool and guidance to know how to achieve the results and

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efficiency gains during the implementation [1]. Based on the lean research, a comprehensive management tool has been created that can assess the achievement in lean (LAT—leanness assessment tool). This tool evaluates the company quantitatively (directly measurable and objective) and qualitatively (perceived by individuals) on the process of becoming a lean organization. The LAT uses eight types of quantitative dimensions to measure performance:

- efficiency of time;
- processes;
- quality;
- costs;
- human resources;
- deliveries;
- customers;
- inventory [2].

Moreover the lean-assessment tool uses five quantitative metrics:

- quality;
- process;
- customers;
- human resources;
- deliveries with 51 evaluation data.

This method helps managers to identify the level of development achieved and to show where there is still backlog. The LAT examines several aspects of the implementation, it studies the following areas: the VSM (value stream mapping), the JIT (just in time) and the quality system [3]. When introducing the lean, it is important to be in addition to the heavily developed areas to improve the underdeveloped departments. To measure the steps of transformation from a traditional organization toward a lean organization, there are many points of view and new research is emerging from day to day. Scientists agree that for the introduction and evaluation of lean approach a dynamic organization is essential. Since the lean management is a socio-technical system, so the assessment of the lean journey is very important, this approach can be successful with the symbiosis of the

development of people and machines.

3. Material and Method

The publication is based on questionnaire data collection, to uncover the lean development the more pronounced points are from the book *Lean Supply Chain and Logistic Management* written by Paul Myerson [4]. The author has examined 15 aspects; employees have to judge 5 to 7 statements on a 1-5 scale, where 1 means that it is not typical of the company, and 5 means that the statement is perfectly characteristic. After the results obtained, according to the analyzed aspects, we carefully considered the possibility of improvement of those areas. Questions related to introducing lean management were answered by managers and middle managers. Planning the future steps and taking corrective actions were discussed with everyone personally afterwards the participants get acquainted with the ideas during a joint training. Regarding the motivation and incentives the opinions of all workers were asked after the lean trainings, since this step, as other actions, should cover the whole organization. During the conversation people were encouraged to explain the improvements through many practical examples, so it was much easier to translate them into practice. In October 2016, they were filled the questionnaires again, so that we can measure the usefulness of developments over the last six months.

4. Evaluating Lean Opportunities in the Company and Measuring Lean Development Progress

The introduction of lean management has a positive impact on the company's profitability and efficiency because of this approach, the buyer receives the ordered product at a more competitive price, in the right quality and as soon as possible. To justify these assumptions an initial process analysis was performed in March 2016, the effects of improvement actions on the organization were re-analyzed according to the previous considerations, half a year later, in October

2016. The improvement in lean development was examined in this publication. It was examined in nine categories: internal communication, visual systems and workplace organization, operator flexibility, continuous improvement, mistake proofing, quick changeover, quality, supply chain, and balanced production. The results of the surveys are shown in Fig. 1.

In March, the company achieved 45.71% in internal communications, in contrast in October, this segment was rated at 62.86%. This is due to the leadership, because they, with the involvement of employees, determined the company's vision and mission. After the description of the goals people were better able to identify with the path to achieving the goals. Positive and negative customer feedback was also used to motivate and develop employees. Satisfied customer feedback encouraged both workers and managers. Negative feedbacks helped to modify the designs and thus proved to be excellent control tools. The managers sought to make the teams more cooperative in every single shift over the six-month period. The office staff

got acquainted with the concept and importance of teamwork at a lean workshop. During the training a company value stream map and product groups were created. During the training it became clear, the extent to which each department is dependent and what steps need to be taken to improve co-operation (Table 1).

Creating product groups is useful for manufacturing planning and trade information: the lead time for some products can be shortened for five days, so the ordered product can be at the customer in a fraction of the previous delivery time. Shrinking the previously 4-5 weeks manufacturing/delivery deadline period enabled the company to reach new market segments and made it possible to introduce to serve the customers with a 2-3 weeks delivery deadline. An error survey was set up, an escalation system; the problem was known by the responsible person within 15 minutes of perception. The root cause was investigated by the responsible manager and the employee together. The "5 why?" method proved to be suitable for searching the root causes. During internal correspondence the effectiveness of the communication was increased because for the

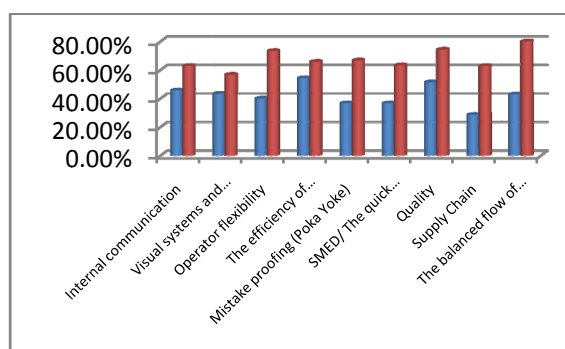


Fig. 1 Evaluation of lean options at NAGÉV RÁCS Ltd. Comparing results of March and October 2016.

Table 1 First lean workshop at NAGÉV RÁCS Ltd.

First lean workshop (trainer's cost 1,000 €/8 hours). The personation is solved.

Participant	1 trainer	Main tasks: - VSM - "Loss" hunting - Deadline for every action
	1 lean engineer	
	1 managing director	
	1 production manager	
	2 shift manager	
	1 quality controller	
	1 salesperson	
	1 production preparatory	
	1 purchaser	
	1 project manager	

Table 2 5S group leaders of NAGÉV RÁCS Ltd.

1 lean engineer worked on two workdays (1.5 hours/training) with 77 employees (7 × 11 employee)				
List of the 5S-chiefs				
	Building	Area	I. shift	II. shift
1	Hall of series	Press	Rudy Gergő	Katonka Zsolt
2	Hall of series	Cutting	Szekeres Béla	Marton János
3	Hall of non-series	Factory	DrágaJenő	Török Csaba
4	Machine-shop	Factory	Gál Zsolt	Tardi Antal
5	Metal-work	Factory		Rákos Ferenc
6	Warehouse	Factory	id. Szatmári István	
7	Office	Office	Szilágyi Mária	
Total number of employees: 77				

recipients a specific deadline was always given by the sender how to perform the task. For that, after a small internet search, an internal education was the solution. The management evaluated employee performance at least monthly, and it was explained what tasks they were satisfied with and why. Furthermore, they highlighted the weaknesses and gave advice on development. This attitude facilitated very much the establishment of trust between the manager and the subordinate, which was perfect for the “empowerment” when an employee becomes almost of his own boss.

Evaluation of visual systems and workplace organization resulted in 43.33% in the spring, and it increased to 56.67% at fall. Isolated islands were designated for the placement of raw materials, semi-finished products, and finished products. Carts for transporting dismembered iron parts were numbered so it was easier to distinguish the main parts from the parts of the main parts. Separate storage device was used for the waste and the scrap. After 5S training sessions, 5S group leaders were selected for shifts and the office to make the system more effective (Table 2).

Cleaning plans were developed, and this is done by the 5S group leaders. Activity boards are used by the shift managers to present which worker works on which machine during the shift. And the corresponding action sheets are placed to special folders which are easily accessible for workers. At the entrances, near the shift offices, bulletin boards were set up where rotation programs and the list of trainings have been published.

In addition the current job offers and company positions are available here. Additionally, production targets and results were also published and updated weekly: mass production (kg), manufactured area (m²) (Table 3).

The operator flexibility was previously 40%, but with continuous improvement this value increased to 73.33%. A new training program for new workers was established, with which the training became much more effective. Mentoring supported the learning process of new entrants. For other employees, a rotation program has been developed, the essence of which is that a worker can perform more jobs, and can handle multiple machines. This can easily reduce the monotony of workers who carry out the same tasks for a long time. Managers made the work environment more and more ergonomic, but the new layout of the machines was not implemented. There was a plan for these, a deadline for implementation, but it had to be scheduled in the long run because it was a cumbersome process. The concept of single-piece flow was introduced at company level, and after the initial test periods, the larger number orders were accomplished by this method. One of the biggest advantages of one-piece flow is that errors can be detected immediately and uncovering of faults is more efficient.

At the beginning, the efficiency of improvements at NAGÉV RÁCS Ltd. was only 52.29%, but in October the result was improved to 65.71%. The cause of improvement in results was the introduction of the 5S system, and the acquisition of the 5S is the basis of the

Table 3 Production weight (kg) and produced area (m²) NAGÉV RÁCS Ltd. March and October 2016.

Week	m ²	%	kg	%
10	1,216.67	55.30%	35,053.74	60.44%
11	1,789.58	81.34%	57,466.40	99.08%
12	3,250.40	147.75%	76,729.44	132.29%
13	2,760.10	125.46%	67,753.54	116.82%
14	1,203.33	54.70%	32,836.20	56.61%
15	3,341.69	151.90%	84,929.60	146.43%
16	1,706.89	77.59%	40,392.11	69.64%
17	1,215.69	55.26%	33,139.93	57.14%
18	1,998.45	90.84%	56,219.34	96.93%
19	1,047.19	47.60%	28,806.75	49.67%
20	1,857.00	84.41%	56,922.20	98.14%
21	1,868.14	84.92%	47,573.45	82.02%
22	3,186.95	144.86%	71,167.87	122.70%
23	3,170.38	144.11%	88,879.25	153.24%
24	2,205.35	100.24%	62,456.60	107.68%
25	1,844.05	83.82%	51,018.69	87.96%
26	2,436.29	110.74%	66,861.10	115.28%
27	2,193.42	99.70%	69,384.82	119.63%
28	2,384.73	108.40%	59,850.94	103.19%
29	3,238.83	147.22%	78,747.83	135.77%
30	3,324.78	151.13%	106,543.89	183.70%
31	2,677.60	121.71%	70,543.76	121.63%
32	500.48	22.75%	12,468.39	21.50%
33	2,431.31	110.51%	62,674.37	108.06%
34	2,477.11	112.60%	59,597.95	102.76%
35	2,639.74	119.99%	71,011.34	122.43%
36	1,681.69	76.44%	46,388.23	79.98%
37	1,840.30	83.65%	48,034.43	82.82%
38	1,374.60	62.48%	38,036.75	65.58%
39	2,772.82	126.04%	69,600.33	120.00%
40	2,145.90	97.54%	51,276.66	88.41%

implementation of other lean tools. An idea generator system was introduced, where each employee's proposal was evaluated by a project team and gave an opinion to the proposer. Then the development of a company-level performance measurement system was started. In the spirit of continuous development and teamwork, employees of various ranks collaborated with only short-term Kaizen projects initially. Its primary purpose was to make workers feel success, and to know the appropriate administrative steps.

The result of mistake proofing was one of the weakest in March. At that time it was 36.67%, but in October it grew to 66.67%. Employees became

familiar with the concept of self-control and were aware that they should not produce poor quality products and should not accept the defective products. A Quality Control Group was set up, whose task is to check the raw material not only on arrival but also during the manufacturing process. The dip galvanization was verified by involving materials testing companies to give the buyer as much as possible best quality gratings. In the case of shortcomings experienced during the work processes, the employee was authorized to terminate the work. If the responsible employee could not solve the problem alone, he or she notified the leader who was the closest in the escalation

process. Component analyses were also performed, using the results, several semi-finished products were redesigned, and with which work-in-process errors were eliminated.

The quick changeovers were rated at 36.67% in the spring, and it grew to 63.33% for six months. When the SMED (single minute exchange of die) improvements were worked out, production plans broken down to work numbers were introduced. Due to capacity planning, the time of the exchanges was designed in advance, and was maintained by the maintenance staff in time to support the production. The results of less than 10-minute exchanges were documented, after that analyzed, and standardized. This procedure was applied to every machine and everybody used the generated checklists to reset the machines, and to start the machines. Moreover also tool development was performed on customer needs which resulted in a product type, previously manufactured only with hand work, whose production process, as the result of improvements, became automated.

Quality has 51.43% efficiency at the beginning of the year and increased to 74.29% in October. The root cause of the weaker performance at the beginning was the slow reaction of the centralized quality management within the group. By creating a quality team, the flow of information became more effective, buyers and suppliers soon got the feedback on the problem after detection. In the course of the complaints, customers received instant feedback about the initiation of the investigation, the answer to the acceptance of the complaint were at their disposal within 24 hours. In order to receive the raw material, a checklist was made containing:

- industry standard values;
- maximum mass values;
- minimum internal diameter;
- the maximum outside diameter.

Due to the effect of one-piece flow, quality has also improved because the defects quickly surfaced. Standards for workstations and sequence of operations

also supported the development of quality. The design of the TPM (total productive maintenance) also contributed to the improvement, as compliance with the maintenance plans kept the machines' in good condition, and instructions for standard replacement of wear parts prevented the production of defects.

At the beginning of the measurements, the rate of supply chain evaluation was 28.57%, according to management evaluation and later already 62.86%. The reason for this was to stay in touch and build good relationships with suppliers. The company was previously characterized that it wanted to solve itself everything without external help. Suppliers of various tools, maintenance companies and labor safety companies had also helped develop the supply chain with their experience: dispensers, and development of kanban systems. In the autumn, negotiations with one of the developing raw material suppliers started with the establishment of the VMI (vendor managed inventory) system. The primary expectation was to introduce the JIT without shipments of delays, and the information exchange between the systems was set up as a 2017 project. Also in internal processes developments were in progression. Surface treatment, post-processing, packaging and delivery of gratings had previously been lasted for at least 4-5 days. After a joint decision the post treatment and packaging processes were insourced to the plant in Hajdúböszörmény. The untreated finished products were shipped daily to the hot hot-dip galvanizing plant of Tiszacsege. They were got back the following day, and that afternoon the after-care and packing of the gratings began, so on the third day the delivery started to the customers. As a result the finished product arrived to the buyer two days sooner and after eliminating the work-in-process buffers it would be improved.

The balanced flow of movements of work and material was rated 42.86% in March and 80% in October. This is due to the introduction of ABC analysis. This helped to ensure that the amount of raw

Table 4 Daily capacity design at NAGÉV RÁCS Ltd.

			<i>Week: 27.</i>				
			Monday	Tuesday	Wednesday	Thursday	Friday
Productline	Assembly	Max. capacity (h)	● 0	● 0	● 0	● 0	● 0
IRS1 /A	RMP2-3/1250 - IRS1	10	10	80	40	0	0
IRS1 /B	200 t press machine - IRS1	30	30	0	20	80	60
IRS1 /C	80 t press machine - IRS1	40	40	0	20	0	20
max. capacity on IRS1 line (h)		80	80	80	80	80	80
IRS2 /A	RMP2-3/1250 - IRS2	100	100	0	70	45	30
IRS2 /C	200 t press machine - IRS2	20	20	120	50	75	90
max. capacity on IRS2 line (h)		120	120	120	120	120	120
IRS3 /A	RMP4-5/1500	10	10	0	30	20	10
IRS3 /B	manual labor	10	10	50	20	10	20
IRS3 /C	500t press machine, imitator	10	10	0	0	0	10
IRS3 /D	500t press machine	10	10	0	0	0	0
IRS3 /E	RMP2-3/300	10	10	0	0	20	10
max. capacity on IRS3 line (h)		50	50	50	50	50	50

material was always available. The company uses this method to update the minimum inventory level of gratings in the warehouse program. In the process there is always a minimum amount of buffers available, so minor failures and the potential shortage of labor can easily be overcome in production. One before weekly capacity planning was replaced by day-to-day production planning (Table 4). This takes into account human resources, machine performance, and transition times.

5. Conclusions and Recommendations

Based on data collection and analysis, the most important conclusions over the six-month period are the followings:

- Business indicators improved, communication became more efficient;
- Thanks to more structured work and the visualization of systems, production deadlines shortened;
- The company increased the number of customers, so the volume of orders increased;
- The operators' flexibility improved thanks to the well-executed rotation programs;
- Continuous improvements were made with the

involvement of employees;

- Upward communication and flow of information have become more efficient;
- The quality was improved within the company;
- The company developed the suppliers;
- With the exclusive use of the pull system, the flow became more balanced and the exchange times decreased;
- Optimizing raw material stocks reduced the lead time and decreased the level of inventory;
- Cooperation between the maintenance and the daily production improved;
- Engineers and employees developed standardized systems;
- Performance metrics were also improved.

Based on our experience, we can make the following suggestions for companies seeking to introduce lean management:

- Relationships with company partners can be developed with continuous communication, with customer visits and factory visits;
- Customers can be motivated by asking them to provide better information to us in exchange for better than expected products;
- The benefits of introducing the lean should be told

to the customers to feel the improvement in our company and to take advantage of the opportunity;

- Particular attention should be paid to measuring performance at the start of the lean implementation, allowing faster progress;

- We advise to put much emphasis on employee attitudes beyond measurable performance;

- For further success it is essential to deepen the lean bases and maintain and develop the 5S;

- Trainings should be seen as everyday tasks;

- The sharing of experience within the company is just as important as new, external impulses;

- To maintaining and further developing the lean approach, a team of people selected from a variety of departments would be ideal and at the same time they would represent the different areas where they are from;

- It is important to implement the basics of a

supplier managed inventory;

- It is worthwhile to outsource the supply of dispensers with the implementation of a Kanban system.

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