

Designing the organizational structure of construction

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Abstract

The modern management the maintenance the state of fitness and the explorational service of machines this about many more than the traditional making the repairs and the preservation of equipment. The ability of survival of whole organization depends from effective strategies the maintenance of fitness often and the technical service of machines the financial shape of enterprise from which depends often. Method TPM becomes with modern tool of maintenance in many enterprises the fitness of machines.

Keywords: the system notion of exploitation machines, evolution of changes, machines task fitness, quality management, TPM method

1 Introduction

The complexity of present technique grows, and electronics, robotics and they influence computer steering on all directions of life, in this on explorational quality of machines. Challenges these brought to many changes in structures of enterprises, influencing on modernization of applied methods the management, the production as well as exploited the maintenance the technical fitness in institution of machines.

The technical progress makes possible designing and the realization autonomic the external systems the supervision of changes of technical state reducing the costs of technical service in time of exploitation. They usually are this co-operating from computer of device enabling detecting the unfitness of objects, before it will come to serious after-effects, and even the destructions. Supervised the change in diagnosing the machines of parameters of technical state they show on change of state of fitness machines often, they can on time warn before coming damage.

It approach such as called using to opinion of changes of state parameters of diagnostic signals preventive, can apply with repair prophylaxis. In real exploational activity the organization makes possible: the planning the service

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technical, the control of costs of service, steering the stores of interchangeable parts, assembling and the analysis of diagnostic data and the registration of damages and the use of operating investigations to modeling the questions of use and the service of machines.

They are the aims of rational exploational workings: the achievement of desirable quality of articles, maximalist economic period of use of machines and the productive equipment together with from maintenance the conditions of safe exploitation and maximization of their productive abilities. This all influences on need of minimization of costs production and the assurance of task fitness of machines, and so few pauses in process of production [6]. The effective achievement above-mentioned the aims possible the TPM is by use of method, the literature report on what show numerous [1,2,3,8] as well as qualitative investigations of this study.

2 Design of construction works TPM and his aimes

The Total the Productive the Maintentance (the TPM) then the system of maintenance of task fitness (the productiveness) the machines and the devices. TPM is the management of the technical systems, in aspect of maintenance of state of fitness, technical readiness and the safety of exploited machines. To reach this one should:

- to alter the "machine" of old construction on modern, to they were more: unfailling, durable, susceptible, easier in use and service;
- to alter the policy of maintenance of fitness of machines, introducing principle: " better prevention from treatment";
- to alter on modern strategies the obsolete organization of system of exploitation the maintenance of fitness and technical services. It in perspective in future marks this the new tasks and the parts for workers of maintenance of movement as well as greater their authorizations and the proxy.

The aims of strategy TPM this:

- the modern systems of maintenance of technical fitness of machines;
- connected the reduction the costs with unforeseen stops with reason of damages;
- the reduction the global costs of durable centres (the investment) the thanks the prolongation the time of working life of machines and the devices;
- the reduction the isolated costs of product the thanks the better utilization fit the and safe machines;
- the improvement the stability of productive process - the process under control of quality of technical state machines is the guarantee of quality of product and his smaller costs.

It to incommensurable aims of strategy TPM was one should: the autonomic management the device by the operator's worker the, larger commitment in aims of firm the workers, growth of the workers' confidence to only me across working of improvement, pleasant surroundings of place of work as well as growth of the workers' safety.

The introduction of method the TPM requires the commitment of workers of whole firm as well as the monitoring the effects of process of introduced changes and possible their correction [7].

The traditional style of maintenance of movement (the task fitness of machines) it is planed, started extemporaneously in case of the pronouncement of breakdown often. The of maintenance of movement propagated by TPM style this planned working, undertaken it is not in case of damage only or the breakdown, but mainly then the preventive working.

Efficient aims of TPM are:

- the reduction of number of damages and the time of duration of restoring the fitness of machines;
- the reduction the creature of causes of damages and the breakdown;
- the reduction the frequency of appearing in work pauses with technical causes;
- reduction the workers' stress, resulting with standstills of machines;
- learning of recognizing and the eliminating the causes before appearing the breakdown;
- the reduction the total costs of repairs (the easiness of maintenance);
- the enlargement the endurnce of component (the Robust the Design).

Above-mentioned the cells and the workings have for task maintenance the continuity of movement of machines and the devices, and in perspective improvement of their efficiency. The important effect of above mentioned is workings the influence of number of damages on structure of losses during production, what in essential it influences on size of losses.

The method the TPM, to she was effective, has to be understood and accepted by whole crew of enterprise, both managerial how and productive. The indispensable element of correct initiation the TPM in institution are the training. The having on aim training first of all moves introduction with method the workers, her aims, way of realization. It plays the main part here the leader of the group which co-ordinates later the working of group. First training be organized for management of firm. The TPM, ways of modernization of organization exploitation machines introduces on him aims in institution, basic principles TPM. It was can distribute on two training this; general consecrated this training time should carry out 2,5 hour. It with method the TPM was one should then acquaint the rest crew it on which was one should to introduce main the working the TPM, stages of independent preservation, examples from different enterprises (the best in figure of film), the task of group the TPM, on board the introduction of data the TPM. To carry out of this stage of training owing general time 6 hours, he should be spread on several thematic trainings.

It moves the next trainings on place of work systematically. It it in time of briefing on beginning of work of line was one should was always remind intentional to achievement cells, read on schedule coefficients current problems. The leader of group leads trainings these or the speaker of working change. The manager of technological section is the leader of group the most often or the foreman who works in this system also. Analyst then the worker of analysis of the work which helps in solving the problems of group works out the results of working in range of method group TPM. The technician of technological team then the engineer of production, he deals with the specialist maintenance the movement of machines. Mechanics, electricians or locksmiths serve the technological section under regard of technical efficiency of machines. The speaker then the representing on individual changes the leader of group person.

All the working in method the TPM be led by specialized groups, and the results and got coefficients as well as the current problems of group from realization of philosophy the TPM - be presented on " the Board the TPM". This tool of visual management is. To impart for task my in aim: the passing on the certainty of, steering the behaviors, of passing on the convictions as well as enlivening to introduced changes the workers' confidence.

3 TPM in industry

It the analysis of introduction on investigative needs was conducted was and the investigation of efficiency of strategy the TPM in institution the Fiat the Car the Poland (the FAP). Firm this existed under name the FSM initially (the Factory of Low-powered Cars) and she came into being in year 1972. Day 29 October 1971 r. officially she was undersigned " the contract about technical co-operation and about license", relating in Poland of model 126. the production For the production of the Fiat 126 was chosen in Bielsk the institutions - White, which for 1 January 1972 the FSM have accepted the name (the Factory of Low-powered Cars). In short period of time in neighborhoods the Bielsk grew the true industrial complex. Works in lap time in Tychy lasted near next institutions, in composition which the departments of presses of, welding, entered varnish and assembly room.[Outline.1]

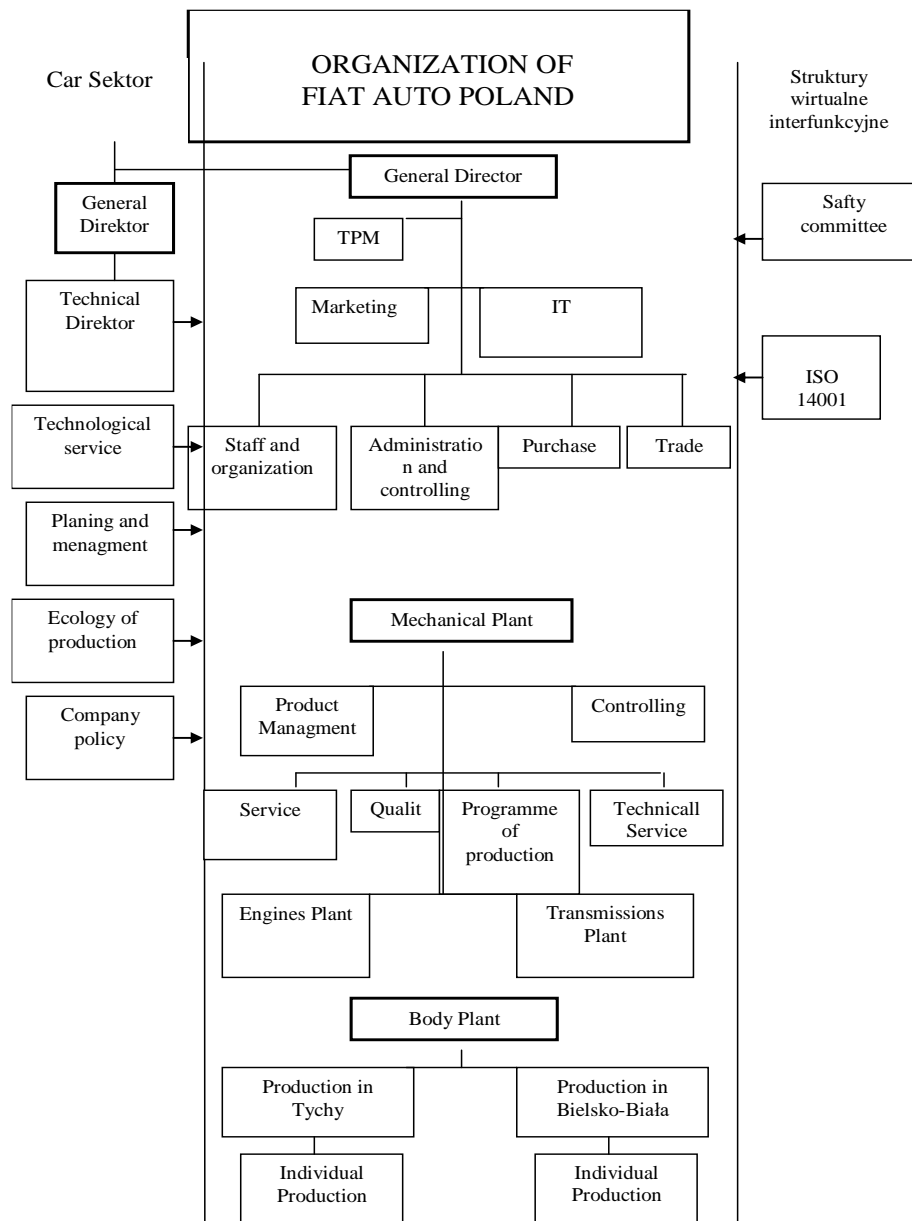


Fig.1. Structure organizational FAP[4]

In November 1990 the Minister of Possessional Transformations signed on the General Manager's conclusion, the FSM the act of transformation at Joint-stock Company the enterprise. Since this moment in draught 2 years enterprise had to be privatized.

In May, 1992 signed became the contract the confirming the creation of new Company FIAT the AUTO the POLAND the S. the A., in the composition, which entered the production the car FSM. Car 90% capital of company was bought through Fiat, and 10% stayed in rule the Treasure Department.

3.1 The computer system profile

Applying in present economy about success in huge degree decides universal technician computer in management. The delivery of required information in suitable place and about proper time, then it means how the most quickly and the how the smallest cost, it is the most often the stepping out critical element in control the firm. They more effective the informative system of enterprise is, this larger it has chance on victory in waltz competitive [4].

The current system the computer administered by Service of Systems FAP and it is the Computer science the result of long developmental process, the dating from beginning existence of enterprise. The foundation of maximum

utilization of supplies at bases of conception this system lay down Fiat Car in Turin. It the property of former Factory of Low-powered Cars was used was in him in range of organizational culture also and the computer science, shaped near help of example intent from Turin. Marriage this permitted on minimization of costs and the shortening the time of introducing the system.

It in first phase of development of system, the so called of "harmonization" from Fiat the Car, in years 1992 the suitable base - 1995 was created was the technical - organizational as well as the computer indispensable systems were started for functioning in organizational arrangement of concern the firm [4]. It Central Computational Centre in period this was reconstructed was and the technology of exchange of data was mastered from Turin near utilization own unite satellite as well as internal net and optical fibers.

The system of calculation of for whole company the rewards on beginning was modernized. It is this the typical example of use of computer technique to managing the central gathering of data. However the example of present of tendency in world computer science, field this in FAP gathers more and more the features the decentralized arrangement the co-operating with me computer stations. In modern firms cannot be place exclusively on deaf and blind terminals in dependent on from central computer the whole. Individual positions have with me to co-operate and to communicate between me how the most conveniently and very quickly.

Since year 1997 FAP administers with all computer systems, what possesses the concern of Fiat in one's seats on whole world. This end of sure principal stage of harmonization marks. Till to be faster than year harmonizing cost about 21 million dollars [4].

The computer systems hug in Fiat the Car the Poland all areas of management today. It it to users' instruction was has given back was over 800 personal computers and 1500 informative terminals. It was used about 40 kilometers of internal net of broadcast data. FAP possesses two own satellite links across Eutelsat and two radiolinie. The informative system steers with processes of flow of materials and on productive lines, it helps the administrative works as well as the inżynierską activity in frames of systems the CAD / the CAM. System this co-operates from Fiat, dealers, tradesmen and banks as well as comprehended transport internal FAP be used in wide.

The company rents at present seven the accounts of access to Internet as well as it uses with throw open through Fiat the Car in Turin accounts. It at concern functions the net of type the Intranet which carries name Fiatnet here. The Intranet is the internal net, closed for external world from clearly quite the definite principles of confidentiality in using with supplies.

It's a different kind of computer nets the Electronic Exchange of Data. (EDI - ang. Electronic Date Interchange). It her work depends on automatic exchange between partners' computers, standard electronic announcements which steer with co-operation. At present in FAP system this be exploited with all foreign tradesmen together and national in range of logistic information. Company is in Poland first exploiting on industrial scale this system enterprise.

The traditional carrier of technical information, what was to recent by hand executed technical drawing, the digital information was replaced in memory of computer. Information this is the base for the computerized technical preparation the production, which component the constructional works are, the study of records and steering the machine tools. Fiat Car Poland applied for the whole of production of cars the system of electronic constructional records. The processing of pistons was used the mathematical models for steering the body also. The thanks accessible in net of Fiat the information possible simultaneous co-operation of many teams, what is the starting the new models of cars shortens cycles considerably. The automation of engeniering works this one of more important conditions of competitiveness of firm in range of technical development of articles [4]. The conferences are in FAP of video one of the most interesting uses of multimedia communication techniques. Technician this makes possible many-sided the communicating across simultaneous exchange of sound and painting.

The FAP applies equipment IBM, Digital, Unix. Programmers, packets and program systems in FAP have different character. They fulfill auxiliary task in computer system management. The special software is the most important part of computer system. It became created by experts in Turin and use it thanks to transfer of technology found in Poland. Two the most important programmers this: the program to analyzing the descriptions the come from with method TPM as well as the program to leadership of statistical analysis.

Introduced to computer system data have different character. In method the TPM are this the most often dependable descriptions of events. In case of method the SPC are then the technical parameters. The procedure of data input is such, that worker makes measurements or the description which be introduced to computer for help of keyboard then [5]. Described software data in system be processed for help higher. In computer system the management the quality of production the FAP complies the come from different sources data. The most important

with them the information is the come from "Cards of Intervention" of method TPM as well as the data with Statistical Control of Process (the SPC). The technique the SPC are so initiated beside different methods of improvement of quality simultaneously.

3.2 Computer system conections with TPM

From Cards of Intervention, which, for help of keyboard moves the data to special program by hand it processes it, delivering the information about number of stops and the breakdown, place of breakdown, time of intervention, quantity of lacks. Data these are the basis to calculations of relating efficiencies of production, causes of rise and the method of counteraction of cost of lacks, breakdown, standstills of machines [6]. The processed information comes back to source of rise in form of concrete decisions of relating qualities of production.

By data from exchanged cards, unusually essential come from with technician data are helping management quality in method TPM. Despite, that the TPM delivers the information about process mainly, then however this is the invaluable method of steering the quality of production, particularly in the enterprise, in which the quality of article, exactitude and the precision of finish as well as depend the future safety of users of cars from efficient the and unfailing machine park.

3.3 TPM in practical use in industry

In 1996 the Institution of Body inflicted a lot of problems. It was with line of processing of trunks engine similarly. Damaged machines arrested whole production, it therefore it was chosen was as device it on which was taught to comply TPM [5]. Frequent and systematic observations they permitted to get to know why devices are so emergency. The experts of maintenance on totality movement knew how to repair machine. It they were showed was the cause now and the ways of prevention the defects. It can will observe already effects after three months. The number of breakdown got smaller radically and long stops. Decision was undertaken about applying TPM in whole Fiat Car Poland. It system was hugged was whole machine park soon, and all operators of machines to his realization were included.

The system of Complex Maintenance of Machines (the TPM) the trainings in FAP is the continuation begun in year 1993 process the creating of groups, and the of structure of factory integrated building. Without these workings the correct functioning of system would not be possible. It methodological trainings were begun was at management of company in year 1996, and then in turn on lower rungs management. On the beginning year 1997, the TPM received the organizational structure, assuring in all directions the instant flow of information - outline. 2.

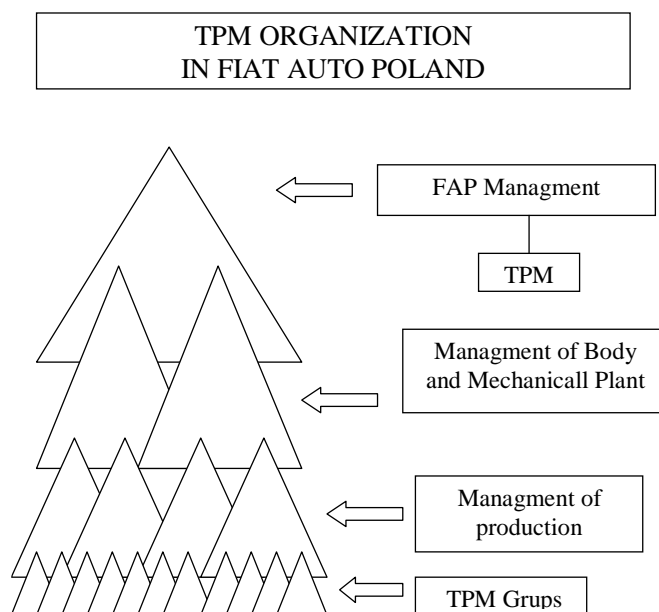


Fig.1. Structure TPM in FAP [study: own]

It workers' group in technological teams was appointed was, with foremen as leaders. All participants of undertaking's active part was one of basic conditions of the success which in effect was reached. It it was be go to was to reach 20 - 30 proportional improvement in growth the real utilization of machines and the devices the, radical decrease the number of breakdown, and what it for this goes - the decrease the costs of production. At present project TPM in Fiat Car Poland is on stage of step sixth, the monitoring the course of realization of intentional aims proves that they become achieved.

Instructors on the beginning of committees of productive individuals stand TPM. Every productive individual (the machine or the team of devices) there is his instructor. The group the TPM hugs the workers as well as the Manager of the Technological Section which is the leader of group.

4 Economic analysis of costs of TPM

The cost of introduction and he carried out the systematizing in FAP the computer system till present moment 21 million dollars. It to this sum was one should to count up in range of method costs of the workers' trainings the TPM as well as SPC.

It to basic costs of quality one should was:

- of prevention, that is the every expenses in sphere the projecting, supply and the production which is aim prevention the losses with reason of lacks. Costs belong here: the planning of production, prevention and the realization of systems and the procedures of steering the workers', trainings quality in sphere of quality;
- of investigations and the opinion, that is the expenses on exploitation of possessed system of quality [7].

Quality the costs of introducing the good systems of management be compensated by got economies as well as effective working in future these systems. Decrease losses and it influences the costs of renewed repairs of, with growth of utilization of ability of supplies together with, on repayment of investment directly. The growth of confidence and the efficiency of working resulting with better acquaintance of process it penetrates the whole organizational structure. Many effects of introduced innovations and the tong - term character has in range the improvements the management the quality, and it can will in full dimension of feelings the got results in future [8].

4 Summary

The quality of centers of production the maintenances of movement, appointed the shortcut TPM in article were talked over the of introducing new principle the conception of management across method complex. The technician this is the present philosophy of management in area maintenance of technical fitness of machines in the institution, in which the suitable engineering solutions in connection with achievements the IT and it with change of culture of organizational firm through prism of priority of quality articles leads to success in figure the maintenance of competitive superiorities.

Fiat Car Poland as one of first firms in Poland worked out and he initiated to his system of quality this method as well as he tied her with computer system. The introduction of above mentioned method brought intentional results, what was quoted in this publication.

Bibliography

1. Szczepańska K., Complex Management Quality TQM, Publishing house Normalizacyjne ALFA - WERO Sp. from about.about., Warsaw, 1998r.
2. The Nagashima the S., Improvement of Management (the training the frames managerial), the Foundation Polish Centre of Prductiveness, Warsaw, 1996r.

3. The integrated Systems of Management, And - sza Conference of Club of Polish Forum 2000, Polanica Spring, IX. 1998r.
4. The book of Integrated System of Management, document the FAP. chosen (aspects).
5. Organizational regulations, document FAP (chosen aspects).
6. The system of Environmental Management according to ISO 14001, the training materials.
7. Borucki W., Urbaniak M., to Define the quality, Problems of Quality of No.. 12, Warsaw, 1987r.
8. The Borys the T., to Calculate the costs of quality, [in:] the Problems of Quality of No..5-6, Warsaw, 1983r.