

Attached Sheet 11

Content of Reports at Final Meeting (Dec. 9, 1996)
(Production Management)

I worked on the job with those involved for a short period of only 40 days, but the people on the production lines absorbed my know-how very well.

I managed to explain almost everything that I initially had in mind to the PP and PR people.

Now it is up to them to carry out the work and gradually accumulate experience in it. Since the people on the production lines have problems, it is up to you who are present at this meeting to listen to them when they come to you with their problems and to give them good advice on them.

Both regular shutdown and "5S" are being properly carried out, and the results have been excellent. The aim in implementing them is stable production. The most important thing for stable production is maintenance. I have had four discussions with the maintenance department chiefs concern how P.M. should be carried out and applied to the whole company.

"Mr. Tashiro, we understand! Don't worry. We will not fail to do it," they told me. I believe them. Please be sure to continue to foster the inspection & planning and maintenance & plant engineering functions, bearing in mind my diagram of "intermeshed gears" depicting the maintenance system.

At my final meeting with Mr. R. Lato's group I was glad to be told emphatically that the people at The Company have forgotten the past and will not return to it but rather will take a new course.

I am reassured. Thank you for your warm cooperation.

* "5S": "seiri", "seiton", "seisou", "seiketsu", "shitsuke"
(keeping everything neat, in order and clean and maintaining personal cleanliness and discipline)

Hideo Tashiro

**HOW TO CONDUCT SURVEY AND EXAMINATION (THE M.E.):
(PRODUCTION TECHNOLOGY, MANUFACTURING MANAGEMENT)**

1. How things have started :

We observed the outline of manufacturing plants yesterday. Since the duration for the first batch team dispatched to Mielec Engines is limited, we attempt to improve production system by selecting model lines and by conducting examination and to diagnose these lines in detail. We wish to have successful results by implementation of above methods. First of all, we would like to discuss with the counterparts of the company side on our views and methods how to implement them if they can agree with.

2. The aim of examination and diagnosis of production system :

We would like to consider and implement how we can maximize the output (product, quality, cost, delivery, safety, moral) at the engine assembly plant while we minimize the input (personnel, machine, material, method, money). The we also would like to confirm the results of the trial. We believe that those mentioned above must be the key which enable the Company to improve its competitiveness and to increase its sales volume.

3. Selection of model lines :

As a result of the yesterday's observation, based on our comprehensive evaluation (judged on the duration for the survey, expectancy of the result, importance, current circumstance of the production site, etc.), we would like to designate following two lines as model. :

No. 1 : Machining Department : machining line for cylinder block (leader : Mr. TASHIRO, assistant leader : Mr. MIYAKAWA)

No. 2 : Engine Assembly Department : assembly line for engine (leader ; Mr. MIYAKAWA, assistant leader : Mr. TASHIRO)

We hereby choose model lines designated above for the trial on following points.:

- * to minimize manufacturing costs -- reduction in defective/failure, increase in yield, reduction in the volume of works in the processes
- * to minimize time for manufacturing -- reduction in time for processing and transportation, reduction in waiting time for processing

- * effective utilization of manufacturing equipments/facilities and reduction in breakdown -- implementation of 3S, routine inspection, and preventive maintenance
- * clean-up and beautification in working environment -- to reduce cuttings, to arrange/ layout things in order, to put up poster
- * to make job place safe and comfortable for working -- safety measures, clean-up of dirty floor, wearing of hard hat

Above points include items for output and input.

We also would like to set the goals for improvement as they enable 50 % reduction in costs or time for manufacturing as to current performance. (N.B. : If time for machining or assembly can be reduced, workers afford to join improvement circle activities in groups. The way of this should be discussed in another opportunities.)

4. Steps to improve the model lines :

- (1) selection of model lines, to determine items for investigation and methods for diagnosis.
- (2) after the company side decides above, to explain to and to get agreement by personnel working in the lines.
- (3) to select personnels who will be engaged in the work at the lines. nomination of the leaders for the team.
- (4) to explain and train about simple method for the teams to conduct survey, examine and improve the lines.
- (5) reshuffling of personnel, designation of person in charge, selection of items for the trial

5. Detail examination of state of affairs in the selected model lines :

- (1) to conduct hearing on whole organization, assignment of personnel and content of the work in charge, etc..
- (2) compiling data on actual time required for machining or assembly, and standard time, etc.. Conducting time study, if they were not recorded.
- (3) the amount of works in the processes, M.H., records of breakdown and repair for each machine.

(4) confirmation of content of duties for operators and mechanics.

(5) analysis on purchased goods and parts, and current cost.

The items mentioned above will be investigated in cooperation with the counterparts.

6. Conclusion :

We, the survey team, understands items and methods mentioned above as proper to conduct survey at Mielec Engines. Considering keys and difficulties in implementation of the trials, such that whether we should have prior agreement by the labor union or not, we wish to have enough discussion with the counterparts in Company to establish circumstances to make them into practice.

WHY WE HAVE TO ACHIEVE REDUCTION IN COSTS

We only can survive by competing with rival enterprises and defeating them in the market economy. In order to survive, we need to offer products of cheap, light, easy in handling, less in maintenance cost or fuel cost, good in design, durable, etc..

In short, the product of cheapest life cycle cost can be the winner in the market. The companies must comply the pressing needs to increase sales volume of their products, develop new one and raise profits for the achievement of the goal. On the other hand, those who responsible for production on the site must prepare for the demand from sales division whenever necessary, by "accumulating technological know-how for manufacturing, cutting off something unnecessary and making effort to improve working circumstances and processes."

We, the members of the first batch survey team have been dispatched to Mielec Engines to achieve the objectives and have repeated observations of the plants, discussions and meetings with the persons concerned since Aug. 21. Because our survey duration in the Company is limited, we are unable to examine and diagnose all the lines in the plants.

We have selected two model lines, i.e. machining line for cylinder block and assembly line for engine, and would like to attempt trials for improvement in cooperation with the workers in the lines and wish them to spread the fruits of experiment all over the plant. However, we only can offer them advises. Please understand that the workers themselves are the actual body to achieve the goals. So, what should be done for that ? For examples, :

- ① to provide output appropriately corresponding to the volume of needs to the lines and to minimize the volume of the works in the processes or inventories of finished products. This will bring effective utilization of capital. (examination of goals and methods)
- ② By implementation of ①, machinery operating time can be reduced. In other word, consumption of tools and jigs, oil or expandable supplies, etc. and cost for repair will be reduced. (to set maintenance items)
- ③ The time allowance caused by the implementation of ①, workers can have opportunities to receive job training. As results, the skill of the workers will be improved. The defectives or failures can be reduced by the practice of routine maintenance or improvement activities by groups. (to educate and discipline the workers)

- ④ By the practice of above points, the company can cut down the costs gradually. (to establish a system which enables to cooperate with Manufacturing Technology PPT, Production Planning PKP, Maintenance PRR and Design RR)

At present, we are considering implementation of the points mentioned above.

We wish the Company to review them enough and to cooperates us to organize the team for improvement.

**THE MINUTES OF THE MEETING FOR EXPLANATION
ON THE METHOD OF EXAMINATION AND DIAGNOSIS**

1. Date and Time : 15:00 to 16:30, Sept. 4, 1996
2. Place : Meeting Room for Members of Board of Directors in Charge of Manufacturing
3. Persons Who Attended the Meeting : Mielec Engines : Mr. J. MADRAY (member of board of directors), Mr. R. SIERAK (General Manager of Manufacturing Department) The Survey Team : Mr. WATANABE (team leader). Mr. WADA, MR. MIYAKAWA, Mr. TASHIRO, MR. HISAYAMA Interpreter : Mr. J. SZULC
4. The Purpose of the Meeting : To negotiate and to reach mutual consent on the selection of model lines and methods to organize examination and diagnosis on the lines during the stay of the first batch survey team.
5. The Outline of the Meeting and Conclusion : Mr. MIYAKAWA : Reporting on the progress of the survey conducted from Aug. 21 to Sept. 4. And he explained about the methods to organize examination, diagnosis and OJT for the lines as mentioned in the I/R.

Team Leader :

He explained the outline of activities of the team in investigating the M.E. based upon the main points in the I/R and was given agreement by the company side. (N.B.: Mr. J. MADRY had not been available when the team had arrived due to his business trip to the United States)

Mr. TASHIRO :

- We, the group for manufacturing technologies and production management, selected the model lines (two lines : the machining line for cylinder block and the assembly line for engines) and explained about the proposal on four points to be implemented at the lines. That was agreed with the Company.
- The team requested to recruit members from 4 divisions of plants, i.e. manufacturing technology, maintenance and production planning for the model lines. The Company suggested to include personnels from supply division as well, so the team agreed to that.
- Since each branch works / functions separately in the Company, the survey team would like to educate the workers to work in a way that the staff and the line workers can achieve goals in a integrated manner.

Mr. SIERAK/ Mr. TASHIRO :

- Since many individualists could be found among employees, especially among staff, the survey team has to make them acquire a manner to work as a team. And how the Company can take the lead of workers ? A foreman supervises 15 to 20 workers. So reorganizing the system by subdividing the current form into smaller groups, and nominating group leader for each group, the management can reduce burden of the foremans'. This one requires to the way of supply the tools....
- The duties of the first batch survey team is, : to select model lines, to nominate the members for the lines, reach mutual consent on the points for the trial between the Company and the team, and teach techniques to conduct survey and improvement, while that of the Company is to master what it was taught by the team to utilize them until the arrival of the second batch team. That was agreed.

Mr. SIERAK :

- Meeting with members for the model lines on Sept. 5 and 6, and we would like to make concrete schedules.

Mr. MIYAKAWA :

The survey team would like to teach the members techniques for improvement activities to achieve the objectives, as well. The team also would like to focus on the matters how it should organize and establish team work rather than transferring of total quality control(TQC) activities, in order to enable the workers to do basic things steadily.

Team Leader :

The team is very much satisfied with the Mielec Engines understanding and consent with the way of group working which is one of special features of this team.

Mr. MADRY:

We strongly request the survey team to instruct members of the groups the proposed methods in order to make them achieve the objectives. Please feel free to say anything concerned.

The Outline of Technology Transfer in the M.E. :

- ◎ Sept. 10, Tuesday, the matters explained to and accepted by the management of the M.E. at the meeting for intermediate report.

(1) The points the survey team wishes to implement on the model lines, :

- to manufacture products in a volume of properly corresponding to that of needs and to minimize the amount of the works in the processes. (for example, to consider manufacturing system for production amount of 8 + pieces in day)
- to reduce the amount of the works in the processes cost for electricity, consumption of tools and oil, and expandable supplies, etc..
- to hold training sessions or seminars in time allowance. to improve skills and reduce breakdown and defectives / failures.
- to organize the trial by the workers in the lines and staffs (PT, PKP, PR, PKZ) in a concerted manner to enable cost reduction and voluntary administration activities.
- to make the routine maintenance by operators

(2) The outline of history of development of maintenance methods in Japan.

(3) Explanation of the differences among the methods for maintenance (BM, PM, MM, MP., Prd.M) by using examples.

(4) the outline of ideas for practice of T.P.M.

- ◎ Sept. 11, Wednesday : The matters explained to and agreed by the circle members who attended training session :

(1) The aims and objectives (50 % reduction in the costs) to organize the improvement team.

(2) Four points to be hoped to the members.

(3) What kind of matters should be implemented by the members ?

- **How to grasp the present situation (explanation on the methods for process analysis and capability analysis)**
 - **How to clarify problems.**
 - **Group activities (PPT, PKP, PR, PKZ and S-378, S-680)**
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- ◎ **Sept. 12 and 13 : Setting goals for improvement and selecting subjects : Please refer the attached sheet for "the Activities of Production Improvement ".**
 - ◎ **Sept. 16 and 17 : How to implement preventive maintenance with maintenance division : Please refer the attached sheet for " Minutes of Meeting on How to Implement of PM ".**
 - ◎ **Sept. 20, Friday : Meeting with circle leaders and counterparts. Please refer the attached sheet for " How to Organize Brain Storming " and " Proposal of Improvement for machining Line for Cylinder Block " .**

THE ACTIVITIES OF PRODUCTION IMPROVEMENT

On Sept. 4 and 10, 1996, we explained the management and the union leader about the purpose of organizing production improvement team. After getting acceptance of the matter, the teams, i.e. one for machining line for cylinder block and the other for assembly line for engine were organized. Then, from Sept. 11 to 13, we repeated discussions and held training sessions with the members of teams and union leaders on "concrete duties to be implemented by the teams". The content of training for the members of the teams were,:

- the aims of the production improvement teams
- the points and expected results of the activities
- explanation of various methods to grasp current problems
- how to organize team activities (S-378, S-680, PPT, PRR, PKP, PKZ)
- how to progress the improvement activities

The leader for each team was selected from the divisions of S-378 and S-680. Fruitful achievements could be expected, since all the members were tackling the duties very positively and enthusiastically.

(A) The contents to be implemented by the improvement team for machining of cylinder block

(primary subject)	50 % reduction in the volume of the works in the processes
(secondary subject)	25 % reduction in breakdown time of machines
(secondary subject)	5% reduction in time for machining processes

The members unanimously decided "concrete objects to be implemented until the arrival of the second batch survey team" as following, :

- (1) Compiling and sorting out of the data to reduce breakdown time of machines :
The cases of breakdown occurred from April, 1995 to September, 1996 will be compiled and sorted out according to the machines and their functions.
- (2) The activities to reduce time for processes :
The actual time for machining and preparation for processing per machine will be measured by time study. And 13 workers will be organized in 2 or 3 groups for examinations to change current on-line inspection system to off-line one under the purpose of reduction in time for machining.

(3) Repair of failure of machines :

The process of the line for cylinder block machining will be partially modified for production of new type engine from Oct. 15 to Nov. 14, 1996. The important machines will be repaired in this time. The rollers of roller table will be washed in the duration, as well.

The members of the teams are following, :

the members of the improvement team of the line for machining of cylinder block :

Leader	Mr. R. LATO (Assistant manager of S-378)
Assistant-Leader	Mr. M. MAJKUTEWICZ (foreman of S-378)
Member	Mr. E. CABAJ (PPT Production Technology)
Member	Mr. W. WIACEK (PRR maintenance - Repair)
Member	Mr. R. HARIASZ (PKZ Supply)
Member	Mrs. U. NOWINSKA (PKP Production Planning)

(B) The contents to be implemented by the improvement team of assembly line for engine:

(1) The decision of subject to be improved :

Discussing on the problems and difficulties in the line, supply of parts was found as a big obstacle. For the last three days, the line was suspended and could not finished even one product due to stockout of three kinds of parts. This problem is considered to be too tough to be handled as the first issue for improvement by the team, but that should be taken up as an initiate posed by the members, with proper considerations for focusing.

The subject to be improvement : too often stockout

(2) The goal of the improvement :

50 % reduction of the stockout case

(3) Survey on actual circumstances :

The survey on the stockout case would be conducted on following points, : the cases as of this April normal manufacturing case), as of September 11, 12, 13, 16, and 17 (before modification of the line) according to QC stories, such as kind of parts, the manufacturers, date to make appropriate focus on the matter. The problems from the needs of production planning for its implement is being focused on.

(4) The members for the team :

Leader :	Mr. R. KOLODZIEJ (foreman of S-680)
Member :	Ms. M. RASINSKA (Production Planning PKP)
Member :	Mr. S. Furman (Production Technology PPT).
Member :	Mr. M. KUDYBA (Supply PKZ)

THE PROCESSES FOR MACHINING OF CYLINDER BLOCK

Number of machine	Machining	Time for Machining
1 103900 (2694)	oil gallery machining	17'58"
2 hand work	hydrostatic test	3'03"
3 2H260 (2725)	simultaneous cutting of top and bottom surface	9'50"
4 103901 (2691)	cutting of bottom	17'15"
5 WR 50/16 (2601)	drilling of both edges of the bottom	7'12"
6 2H332 (3345)	partial cutting of both front and back, top and bottom (roughing)	8'15"
7 103903 (2770)	ditto. (finishing)	6'14"
8 103904 (2729)	cutting of both sides	7'59"
9 103906 (2755)	boring of cylinder	10'50"
10 103908 (2758)	machining of crank and cam shaft hole	10'25"
11 103902 (2728)	machining of face for crank shaft bearing	11'41"
12 103905 (2726)	machining of hole for attachment of crank shaft bearing	4'02"
13 103912 (2707)	machining of in-between caps of crank shaft	3'25"
14 103917 (2692)	milling of face for attachment of pump	()
15 103914 (2774)	machining of holes for cooling water on the both sides of cylinder	15'22"
16 103915 (2706)	machining of holes for oiling of crank shaft bearing	6'01"
17 WR 50/2 (2938)	boring	0'58"
18 103916 (2757)	machining of holes for oiling of cam shaft	0'58"
19 2M55 (3515)	machining of screw holes for bolts of crank shaft	12'02"
20 GRV553 (4497)	boring	--
21 WR 50/2 (5053)	ditto	12'05"
22 RF31B (2496)	ditto	14'21"
23 RF 31B (2497)	ditto	--
24 103909 (2775)	multi-spindle boring	6'21"
25 WR 50/2 (3031)	boring	6'55"
26 RF31B (0173)	ditto	7'21"
27 LSP386 (4743)	boring, thread cutting	()

28	103910 (2760)	multi spindle drilling, boring for front and back	()
29	LSP385 (4742)	multi spindle drilling, thread cutting for single face	()
30	RF 31B (2495)	boring	()
31	103919 (2695)	ditto	()
32	103911 (2730)	multi spindle drilling for top and single side	()
33	103918 (2731)	multi spindle drilling for front and back sides, thread cutting for single side	4'05"
34	MT00 (0432)	washing	10'00"
35	013-261/009704	hydrostatic test for oiling holes	3'20"
36	hand work	attachment of caps for crank shaft	5'24"
37	T-0189	boring	5'10"
38	103913 (2769)	machining of bearing for crank shaft and camshaft (roughing)	5'52"
39	103920 (2928)	ditto (finishing)	9'10"
40	103921 (2756)	drilling of crank shaft holes	5'20"
41	E2080 (4958)	boring of oil pump	6'15"
42	103907 (2761)	boring of cylinder bore (roughing)	8'16"
43	WR 50/2 (2975)	boring	--
44	WR 50/2 (5056)	ditto.	--
45	103922 (2831)	boring of cylinder block (finishing)	12'00"
46		milling of top of cylinder block	8'10"
47	103923 (2690)	grinding of cylinder bore	15'15"
48	013-871 (6700)	finishing of channels on cylinder top	5'33"
49	SZXM (3918)	washing	10'00"
50		hydrostatic test for holes for cooling water	4'15"

total : 5 hours 18 min. 28 sec.

N.B. : According to the data from Mr. R.LATO, :

- actual machining time for 1 piece of cylinder block (time allowance included) :
7 h 01 min. / piece
- machining time for 10 pieces of cylinder block + α :
1 h. 05 min. total:
Total 8h. 06 min. / 10 pieces

Total number of machines used in the line

44 (including 11 boring machines):

※ A survey is ongoing on which machine had most frequent breakdown by PRR. The result of data analysis will be available at the arrival of the second batch survey team.

ATTACHED SHEET 18

THE MINUTES OF A MEETING ON HOW TO IMPLEMENT PM

Date : Sept. 17, Tuesday, 10:00 to 11:00, Sept. 16, Monday, 10:00 to 11:00
Members : Mr. M. SZYPULA, Mr. W. MOL. Mr. W. WIACEK, Mr. BOMBA

- Sept. 16, Monday : Discussion and Explanation on How to Implement PM with Mr. M. SZYPULA
 - (a) Explanation for functions of maintenance system, and inspection and engineering.
 - (b) Since the Mielec Engines is lack of these two functions, it should implement the points with assignment of personnel at least. At present it can not find any appropriate persons for the job. The persons should be selected from current employees. They are not necessarily being designer of engine. As far as they understand mechanism and operations of machines, I will bring up them into experts during my stay in the Company. The M.E. has personnel for planning. The person and Mr. W. WIACEK will be assigned to the job. Since we do not have much time, we will have meeting on that tomorrow, on Sept. 17.
 - (c) Since PRN-070 has branch for technical service while PRR-204 does not have technical section, we wish to give the two persons training so that they can work as a group of maintenance engineering.

In the future, it is helpful if the these technical sections will be integrated as one and will provide staff directly under the manager of maintenance. If the Company will not implement this, it may have difficulties in security of production due to troubles of maintenance. I can propose it to the management if you wish. So please consider it sufficiently. Then, we would have discussion on this matter with persons concerned.

- (d) Does the Company grasp how much it has spent for the maintenance cost ? It does not. However, the budget for the 1996 is already made up, it can gain the figure if it checks, although it only can know is the amount for subcontract or for purchased goods. The cost is key. Please investigate how much the Company has spent for it including direct cost for that until the arrival of the second batch team. I also will check the cost of that in Japan.
- (e) At present, the Company only takes measures for the breakdown after it happened. Now, the production volume is not so much, however soon this way causes troubles if the amount goes up. Of course, we do understand the situation. However, the board does not wish to spend money for that. Unless the maintenance division itself initiates PM positively, the matter will not be changed. The division should appeal taking leads. And I will support it.... That will be helpful.
- (f) At present, we need one person for inspection planning and one for maintenance engineering respectively. The necessary two personnel will be trained and we will implement and proceed PM with them, by setting important machines as models.
- (g) That is too late to finish planning until the expected anual big26

scale shutdown plan, and the 23 cases are not enough for that. There is noway, we do not have sufficient manpower and budget.

• Sept. 17, Tuesday : Repeated Discussions on How to Implement PM and to Proceed it :

- (a) Did you finish sorting out of the data on cases of breakdown in the cylinder block line ? (Mr. W. WIACEK) Now I am making the data for 1995 in order. There are 42 machines in the line and 30 % of them often broke down. The rest of them seems not to have problem.
- (b) Here, I show you how to sort out and analysis the data. You set out all the machines like the diagram shown on the left. Please make the diagram as we can grasp the data easily. All right.

First, we would consider to implement PM by picking up three machines based on the data analysis, because implementation for all would be difficult.

- (c) We have made maintenance planning and budget every year and we can show you these documents at any time. Since the Company does not have money sufficiently, nothing will be changed unless we can appeal planning to the board successfully. Thus we will show the data on actual situation of breakdown shown at (b) to the board. And we need to tell it the amount of necessary money to minimize the breakdowns of two or three machines with the data.

At this time, we would like to go this way. All right. That is important to keep on expanding this way.

- (d) From Oct. 15 to Nov. 14, we are considering to conduct overhaul for 2H332 (3345) during the shutdown. That is the machine pointed out by Mr. H. TASHIRO. Please make a mechanism chart for the machines when they will be overhauled. Only making it for mechanism of cutter is enough. If the gear is worn out, please draw it. If necessary, prepare spare parts before. This way is the preventive maintenance. Then we explained inspection and engineering. And we appealed function of maintenance system and to let the two persons do it.
- (e) Unless the maintenance division leads the production site actively, it will use the machineries as much as possible. Why do not we set a day for regular shutdown although the Company, at present, repair after having breakdown. Since the line for cylinder block is continuous, even a minor breakdown causes serious impact all over the lines. For example, why can not we set regular shutdown twice a month. Now, the Company operates two Saturdays in a month, we can use the days for regular shutdown. On the day, the maintenance division will repair machines, and the operators practice the 3S.. We would like to propose this to the second batch team.
- (f) Since the maintenance division has less number of the personnel, we can apply contracted repair. However, it is expensive, according to the management. We can not contract them on the basis for the payment per machine, with check-up. They would take advantage for the company's weak position. Thus the Company should designate the items to be repaired as well as making estimate of the cost for that by itself. The functions of inspection and engineering are required for this purpose, too. As far as the Company understand the situation, the maintenance firm can not price high.
- (g) From Oct. 15 to Dec. 15, the Company will suspend lines to modify them in the order of cylinder block first then head and crank shaft. Please maintain and repair them sufficiently during that time. When the second batch team will arrive, we cooperate to proceed PM for the model lines at first.

HOW TO ORGANIZE BRAIN STORMING :

Subject : Why the line can not keep production amount of 10 cylinder blocks per day ?

The way to organize the brain storming is to give opinions by all the members, then to prioritize them in the order of the viewpoints which is closer to the real causes or more effective to seek the causes and to discuss on the steps for them.

Example : Giving the reasons for the subject, :

- (1) Because the delivery will be delayed if the cast metal material carries blowholes.
- (2) Because the workers idle away due to reduction of the amount of the work.
- (3) Because the workers are anxious unless they have excess cylinder blocks which are prepared to be processed at any time.
- (4) Because excess production has been a custom of the job place over 20 years.
- (5) Because the workers have too much waiting time and nothing to do otherwise during the time.
- (6) Because the line often required to manufacture prioritized products under the emergency order.
- (7) Because the line can not expect the breakdowns of the machine.
- (8) Because the line has to produce various types of products, such as right type or left type.
- (9) Because the branch responsible for implementation of production planning does not point out the problem persistently.
- (10) Because of incentive wage system, the increment of production volume leads rise in wage of the workers.
- (11) Because the life cycles of the tools are not even.
- (12) Because the line sometime sends the products to service shops as spare parts for the case of failure.
- (13) Because the line is not provided with stable acceptance of materials for the cylinder blocks.

**PROPOSALS OF IMPROVEMENT FOR THE MACHINING LINE
FOR CYLINDER BLOCK**

" Example for Improvement in the Machining Line for Cylinder Block "

Proposal (I)

1. The reason why the subject has been selected: to reduce the amount of the works in the processes in the lines and to utilize capital effectively.
2. Goal :
50 % reduction of the actual amount as for August, 1996. (to be accomplished in Nov. 29, 1996)
3. Effect :
reduction in the amount of works in the processes.
(25 pieces / month x 11 month = 275 pieces / year)
reduction in interest
(2500 zloty / piece x 275 = 687,000 zloty x 0.29 = 200,000 zloty / year x 0.5 = 100,000 zloty / year)
4. Process of the improvement :
The time required to the machining of product in the line was measured at the process analysis conducted in September, 1996. The value will be remeasured and confirmed if it is appropriate. After that, the steps to reduce time for machining (e.g., changing current on-line inspection to off-line one, etc.) will be implemented.

(the cost for parts, i.e., that for purchase, will be reduced in accordance with the reduction of the works in the processes for cylinder block, ¥ 1.3 billion x 0.7 = ¥0.91 billion x 0.29 = ¥0.27 billion x 0.5 = ¥0.15 billion)

Proposal (II)

1. The reason why the subject has been selected : to reduce the time of machine breakdown in the machining line for cylinder block because that is too much.

2. Goal :
25 % reduction of the average monthly breakdown time based on the data for actual breakdown from April, 1995 to Sept. 1996, conducting a survey for that. (to be accomplished by Nov. 29, 1996)

3. Effect :
Monthly manufacturing time is, :
 $8 \text{ h. / day} \times 24 \text{ days / month} = 192 \text{ h. / month}$
reduction in rate of breakdown from 8 % to 6 % is, :
 $192 \text{ h.} \times 0.02 = 3.84 \text{ h. / month}$

Thus, this improvement may produce another 3.84 hours for manufacturing and it means, assuming the output of engines as 8 pieces, 4 pieces of increment in monthly production.

4. Process of the improvement :
As results of study on actual breakdown time, the important machines which have occurred frequent breakdown will be indicated. The system to implement preventive maintenance for these machine will be prepared.

Proposal (III)

1. The reason why the subject has been selected: to improve the situation on the rollers of roller table which is extended approximately 350 m in the machining line for cylinder block because their surface has been fouled and blackened with oil and dust. This may cause adverse effect on the working environment and motivation of the workers.
2. Goal :
Washing and clean up of all of them (approximately 3,500 rollers) and bearings with washing oil by detaching from the table during Oct. 16 to Nov. 15, while the line will be suspended for modification. (to be accomplished by Nov. 29, 1996)
3. Effect :
First of all, the working environment will be arranged in order, cleaned and improved. Rotation of the rollers will be better, and it will reduces physical burden on the workers. The result will be a model for the other job places and they may follow it.
4. Process of the improvement :
The 13 members for the team will be divided into two or three groups and each group bears responsibility on its jurisdiction. The duties will be implemented by the groups. By taking pictures before implementing improvements, the results will be compared with the photos later on. Clean-up day, once a month, will be designated from coming December and implemented regularly.

ATTACHED SHEET 21

**The Impression of Observation Tour for
the Plant of PZL-RZESZOW S.A. and Mr. S. DZIK**

When we were invited into the meeting room, comparatively high tone noise from fan belt grated on my ears. Since I stood on the window side, it made me uneasy. Later on, when I checked it, 4 or 5 fan belts from cyclone had gone slack and slipped. The reception room for the president. I thought that should be taken more cares because it had many guests and they might have negative images.

Mr. S. DZIK began to give us introduction on the firm. He was having guests of 8 members of board of directors from regular clients and ourselves, Japanese. Under the current recession, I did not expect to hear from him about restructuring of the company, but also the story I heard could not be a proper one for the person met first time. He was nearly saying that the RZESZOW S.A. did not mind if Mielec Engines could switch the firm to place orders, when it had complaints on the products of the RZESZOW's. He seemed to be a person of considerable self-confident and in the instance for boxing, he might intend to give us a damage by strong punch at early round. Where could we find the spirit of the company which enabled it to get the ISO 9001 qualification ?

As I anticipated, 3S practiced in the plant was not sufficient. Although we saw a poster of 5S on the side wall of annealing oven, that seemed to be only a objective without activities. Especially, I felt that the process for the cylinder blocks to be delivered to the Company should be improved. The parts were turned up-side-down after process of shot blast in the plant to eliminate shot and dust inside them by fork-lift. That rose a cloud of dust around the place.

However, the foreman, who took us to the observational tour for the plant was considered as a fairly excellent person with high technical skill. The personnels from the RZESZOW might be too nervous to speak such provocative words because of having a group of guests, including Japanese, crushed in on the company. They might be that they were just trying to protect themselves not to be overwhelmed by us. They seemed having basically good nature, I thought. Even now, I can not forget their words and smiles given to us at the time to say good-bye.

END

I wrote this paper personally under the request by Mr. R. SIERAK.

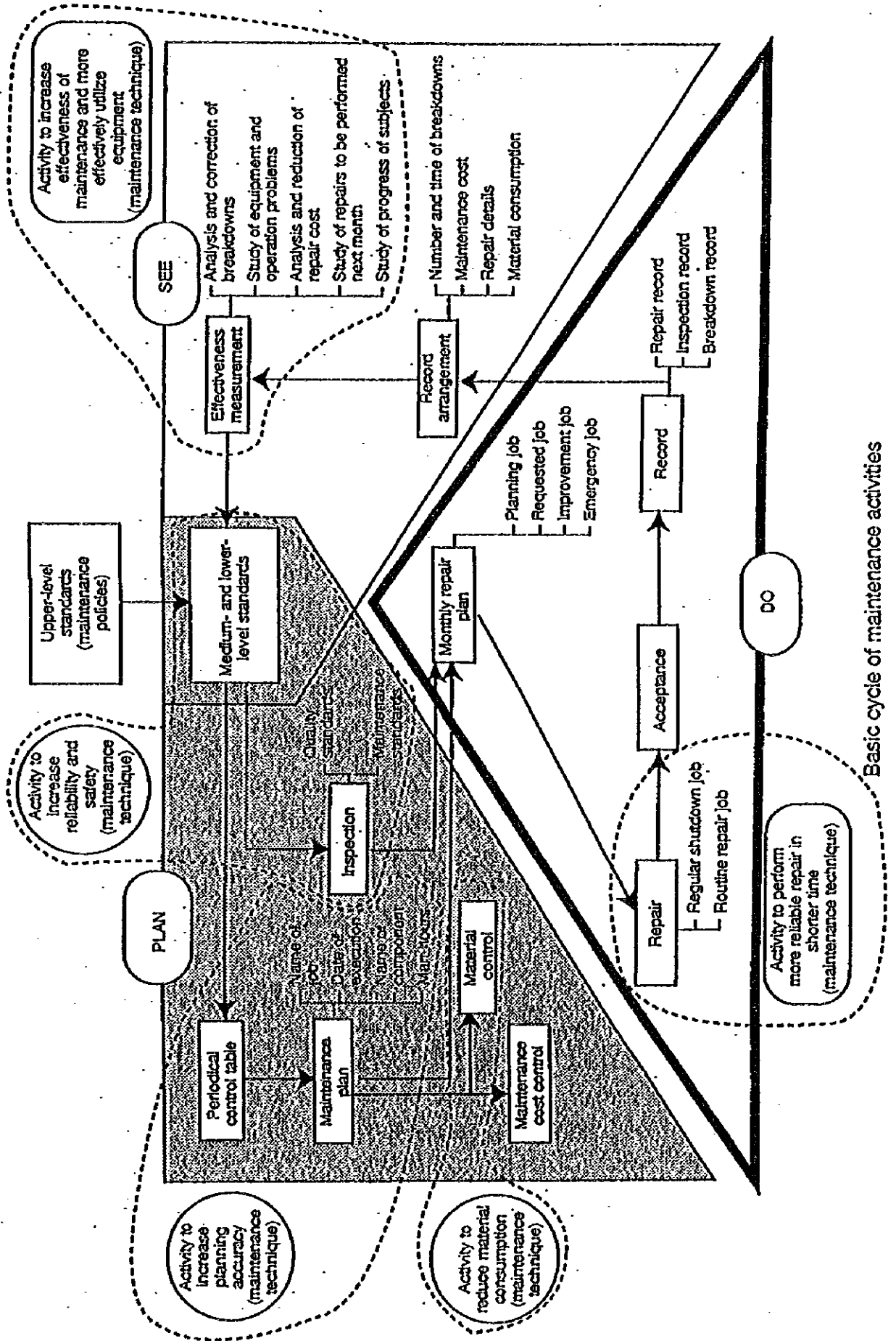
(N.B.) In the answer from Mr. SIERAK, the Company wishes to place orders for cylinder blocks on two manufacturers after this.

STEPS FOR IMPLEMENTATION OF P.M. INTO THE M.E.

Here, the steps for implementation of P.M. into the machining line for cylinder block are shown as following, :

1. First of all, to designate important machines to implemented the P.M.. Cylinder block is finished after machining and processing of 50 steps by 44 machines. Machines which have occurred frequent breakdowns are designated by ABC analysis as important machines.
2. To practice regular shutdowns(8h.) twice a month and to repair machines based on planning. This is defined as regular shutdown.
3. The maintenance branch prepares planning sheet for regular shutdown and holds meeting with production branch on the selection of the items to be done at the maintenance. This should be completed until by 3 days before the shutdown.
4. The production branch always includes regular shutdown (to be practiced on every other Saturdays) into the monthly production planning.
5. The production branch will implement 3S to the line for cylinder block positively during the expected suspension of the lines. Especially, clean-up for oil leakage and machines themselves, and removal of cuttings , etc. should be practiced.
6. The production branch should conduct test run of the machines after the completion of repair and confirm the results.
7. The production and maintenance branches should keep records of repair / maintenance by machine. And replacement of cutting tools and drills should be recorded in another one.
8. The records should be analyzed in every month and are to be reviewed the steps for problems as well as making them into charts or diagrams.
9. The maintenance branch should feed back the results of regular maintenance to the next maintenance planning.

ATTACHMENT SHEET 23



ATTACHED SHEET 24

EXAMPLES FOR PRACTICE OF MODIFICATIVE MAINTENANCE :

Here, the examples for modificative maintenance in the line for cylinder block are shown as following. :

1. To make scaffolds, jigs and tools for exclusive use for production to enable easier dismantling of machines and their casings, etc. for safe, quick and steady working.
2. To modify the carriers / vehicles, equipped for insertion of cylinder block into machines at present, into those with compatibilities. And the small rollers should be modified those with structure to prevent cuttings into them.
3. To examine methods to remove cuttings produced in machining and to recover them, etc..
4. To examine the capacity of dust collectors equipped with machines and to modify inlet of the collectors. Almost all of the collectors, at present, are not working.
5. To examine to extend life cycle of cutting tools and drills and their span for replacement.

IMPROVEMENT FOR THE PROCESSES OF MACHINING OF CYLINDER BLOCK

Number of machine	Machining	Time for
① 103900 (2694)	Machining oil gallery machining (improve gun drill)	17'58" (8'00") ()
2 hydrostatic test	3'03"	
③ Newly established	milling for 6 surfaces by numerically controlled machine with A.T.C (C.B. rotation of four surfaces)	10/shift (approx. 100 million yen) 2-shift machining
4 103906 (2755)	boring of cylinder	10'50"
5 103908 (2758)	drilling of holes for crank and cam shaft	10'25"
6 103902 (2728)	machining for bearing of crank shaft	11'41"
7 103905 (2726)	machining for hole for attachment face for bearing of crank shaft	4'02"
8 103912 (2707)	machining of in-between caps for crankshaft	3'25"
9 103917 (2692)	milling for attachment face for pump	
10 103914 (2774)	machining of holes for cooling water on both side of cylinder	15'22"
11 103915 (2706)	machining of holes for oiling into bearing for crank shaft	6'01"
12 103916 (2757)	machining of holes for oiling for cam shaft	0'58"
⑬ Newly established	boring of five surfaces by numerically machine with A.T.C. (C.B. rotation for three faces)	10/shift (approx. 150 million yen), 2-shift machining
14 MT00 (0432)	washing	10'00"
15 013-261/009704	testing for leakage of oiling holes	3'20"
16	attachment of cap for crank shaft	5'24"
17 T-0189	boring	5'10"
18 103913 (2769)	machining of bearing for C.S. 4 cam shaft	5'52"
19 103920 (2928)	machining of bearing for crank shaft and cam shaft	9'10"
20 103921 (2756)	machining of holes for crank shaft	5'20"
21 E2080 (4958)	boring for oil pump	6'15"
22 103907 (2761)	boring of cylinder bore (roughing)	8'16"

23	103922 (2831)	boring of cylinder bore (finishing)	12'00"
24		milling of top surface of cylinder block	8'10"
25	103923 (2690)	polishing of cylinder bore	15'15"
26	013-871 (6700)	machining of channel on the cylinder top	5'33"
27	SZXM (3918)	washing for body	10'00"
28		leakage test for cooling holes	4'15"
		total :	3*27'45" + (3*57'15") (7*25')

N.B. Machining for 10 pieces of cylinder block by one shift:

investment for equipment : total 250 million yen + (No. 1 machine)

* the first investment in 1997 : 100 million yen + (for machines No. 1 + No. 3)

* the second investment in 1998 : 150 million yen (for machines No. 13)

3.2 Quality Control and Improvement of Engine Assembly Line

3.2.1 Quality Control Aspect

There are many facets of the company's activities for promotion of quality. This section deals with the content of quality control in its plant improvement activities and examples of improvement, particularly as regards the engine assembly line.

- (1) Although acquisition of ISO-9001 certification has been established as company policy and ISO-9100 groups under the direct control of the company president are now active as centers, only insufficient results have been achieved so far company-wide. In many cases smooth progress is made in preparing the ground for such activities in the case of plant departments because an early start is made.

In the Company's case, too, they are making headway in a progressive manner as regards things such as establishment of documentation, and one can say that, at least in terms of form, smooth progress is being made. For example, they have already started to use cards of different color: green cards for products that pass inspection, yellow cards for products that have to be reworked a bit and red cards for off-spec products (see Fig. 3-2-1).

Wydzieł 50.010 "PZL - Mielec" Spółka z o.o.		KARTA STATUSU WYROBU		PJ/4.12/02/00	
WYRÓB ZGODNY					
Nazwa części podzesp. zespołu			Numer rysunku		
Numer Przewodnika			Ilość sztuk		
Numer operacji		Ilość szt. w 1 opakowaniu lub na 1 zmianę roboczą	Ilość opakowań	Numer opakowania	
Uwagi: Potwierdzenie nadania statusu					
(w miejscu podpisu)					

Card for units that have passed inspection

Wydzieł 50.010 "PZL - Mielec" Spółka z o.o.		KARTA STATUSU WYROBU		PJ/4.12/02/00	
WYRÓB NIEZGODNY					
Nazwa części podzesp. zespołu			Numer rysunku		
Numer Przewodnika			Ilość sztuk wg Przewodnika		
Niezdane po operacji		Ilość opakowań	Numer opakowania	Ilość w opakow. lub na zmianę rob.	
Nr		Ilość sztuk	Sztuk		
Potwierdzenie nadania statusu					
Karta Niezdane Nr					
(w miejscu podpisu)					

Card for units that need to be reworked

Wydzieł 50.010 "PZL - Mielec" Spółka z o.o.		KARTA STATUSU WYROBU		PJ/4.12/02/00	
WYRÓB WADLIWY					
Nazwa części podzesp. zespołu			Numer rysunku		
Numer Przewodnika			Ilość sztuk wg Przewodnika		
Niezdane po operacji		Ilość opakowań	Numer opakowania	Ilość w opakow. lub na zmianę rob.	
Nr		Ilość sztuk	Sztuk		
Potwierdzenie nadania statusu					
Karta Niezdane Nr					
(w miejscu podpisu)					

Card for defective (rejected) units

Fig. 3-2-1 Parts Tag for Machining and Assembly Lines

- (3) It appears that utilization of quality control techniques has finally entered the implementation stage. At machinery plants control diagrams are posted on the lines, but they are even printed in color and very attractive, which leads me to doubt that full use is being made of them in terms of day-by-day raw data. Nevertheless, their enthusiasm concerning making progress, even if only step by step, is commendable. In undertaking improvements in the assembly section, as described later, I was guided by the thought that if only a little better understanding of QC techniques could be achieved, that would represent a form of technology transfer.

3.2.2 Improvement Proposals Centering on the Engine Assembly Line

Since I covered the engine assembly line at the time of the first study, I pointed out the places with problems on the lines chiefly with respect to that line and besides confirming the fruits of the improvement activities undertaken by the company's members, was active for the purpose of technological transfer of the improvement techniques.

One of main items of the study group's activities this time was vitalization of improvement activities on the lines and helping them take root. That is set forth in the summary activity plan presented in the Inception Report, and I believe that we were, more or less, able to accomplish what was planned (see Fig. 3-2-4).

The main aim was that of getting them to experience directly the real significance of improvement by organizing two improvement teams at the company and having them achieve improvements themselves through their activities.

Since the circumstances up to establishment of the team activities are explained in section 3.8 in connection with description of the assembly department's improvement team activities, here I would like to discuss mainly other nonconformity proposal items that I pointed out on the line (the improvement proposals given as Appendix 5).

I selected items for which results could be expected if only they were carried out and for which the significance of the improvement would be considerable instead of overly difficulty themes considering the goals.

- (1) Proposal item: many parts supply shortage (task of the company's improvement teams)

The improvement team of the assembly department was formed, and discussions were held concerning selection of improvement themes. This item was taken up because as a result of consideration, by all four members of the team, of the problems hindering production, all of them identified "product parts supply shortage" as a common headache and the biggest problem on the assembly line. Thanks to the improvement team's efforts it was possible to determine the direction of improvement through their study of QC techniques. When the team leader announced the results at the productivity improvement seminar, his report was very well received.

The team can be considered to have learned a lot, including how to go about the work and "QC story" techniques of solving problems. The photo in Fig. 3-2-5 shows a scene of explanations being given at the reporting session of the productivity improvement seminar.

(2) Proposal item: doing away with wire stops of bolts

I noticed that right away in the assembly procedure, making the improvement proposal together with the person in charge of design. They are used at 7 places and require 7 minutes of work time. That work is already no longer being done in Japan, and I made the proposal because I thought they should be done away with as long as that did not cause any design problems.

When I checked in the second study, there had already been some design change, and it was already reflected on the line. They intend to start it in production in December and, after considering the market circumstances six months later (claims, etc.), have it officially reflected at that time. It also appears that they have coordinated it well with the service department.

Fig. 3-2-5 and 3-2-6 respectively show the situation before and after the improvement.

According to the third examination, these were excluded from the plan requirements book on February 1.

(3) Proposal item: bad management of pipes on the line side

The way the pipes are placed for storage on the shelves and pallets on the line side is disorderly, and the vinyl bags at both ends are ruptured or have come off.

The proposal was made because that causes quality problems such as entry of extraneous matter and damage to the surface.

The tentative countermeasure is that of again covering with vinyl bags the amounts of pipes taken from the warehouse, the pipes already being covered with vinyl bags when they are delivered by outside order to the warehouse. As the final solution it is intended to change the delivery packing and study the possibility of coordination of the packing with the quantity taken from the warehouse to the line. They deserve praise for the fact that they have gone so far as to consider a final solution as well and not just a tentative one. Fig. 3-2-7 and 3-2-8 respectively show the situations before and after the improvement.

According to the third examination, pipes are packaged in sets of 10 and sent off the line.

(4) Proposal item: improvement of washing of Crank Shaft Brg. Metal

Since the washing vat did not have a level gauge, the level was low, and some of the surfaces were insufficiently washed. That meant that it was not possible to properly remove the dust, shavings, etc. which are mortally dangerous to engines, and therefore this item was proposed as a very important one.

The countermeasure was that of installing glass on the side of the vat so as to make it possible to keep an eye on the level of the liquid in the vat (see Fig. 3-2-9). Furthermore, as a final solution they are considering changing the delivery packing in the future so as to be able to do away with washing. A sample of the new packing has already been obtained. When I returned to Japan, I noticed that that measure is the same as that adopted by Isuzu Motors. That shows how flexible the thinking of the people at Actual Plant Operation is and how serious they are about making improvements.

I included this item in my talk in the productivity improvement seminar. It did that so as to

stress the point that there are many different measures that can be taken to make improvement concerning particular problems and that the ultimate improvement is that of making the work in question no longer necessary.

I also proposed joint use of a pump and filter for removal of shavings as an additional measure, and I noticed that they added a filter to another crank shaft washing device in the immediate vicinity (see Fig. 3-2-10).

In view of the fact that they implemented such "horizontal extension" on the basis of their own judgment, the flexibility of the thinking of the company's employees merits high appraisal.

According to the third examination, since parts are vacuum-packed, cleansers have no longer been needed since February 1.

(5) Proposal item: insufficient management of Brg. Cap placement table on assembly line

The table for placement of the parts after washing had been dirty, a situation that would make you wonder what in the world the washing was for, but now they have taken the measure of replacing the paper on the table by a cloth that is to be washed and replaced at regular intervals.

(6) Proposal item: reduction of the number of in-process engines on the assembly line

That is a proposal that was added at the time of the second study. In view of their above-mentioned ability to implement improvement proposals and the active posture of the company's top management concerning improvement, I thought that they were capable of that as well and presented it as something to think about. What it involves is taking only every second bench on which the in-process engines (maximum of 30) are placed on the assembly line and doubling the line speed, thus reducing the in-process volume to 15 engines. This item has many other advantages as well, including the problem of defects. Before an engine was on the line for 3 days, and it was possible for it to come off it as a completed engine by that time is the necessary parts arrived during that 3-day period, but since the time on the line will not be only 1.5 days, which will put a healthy sense of tension in parts procurement and make it easier to adapt to production increases in the future.

They made the change right away. Three days later the in-process volume had been halved. Furthermore, investigation of the situation thereafter has shown that lacking parts have not increased and that they are putting an enormous effort into making sure that the necessary parts will be available on time, which makes for healthy tension in their work.

Fig. 3-2-11 and 3-2-12 show, respectively, the situation before and after the measure was taken.

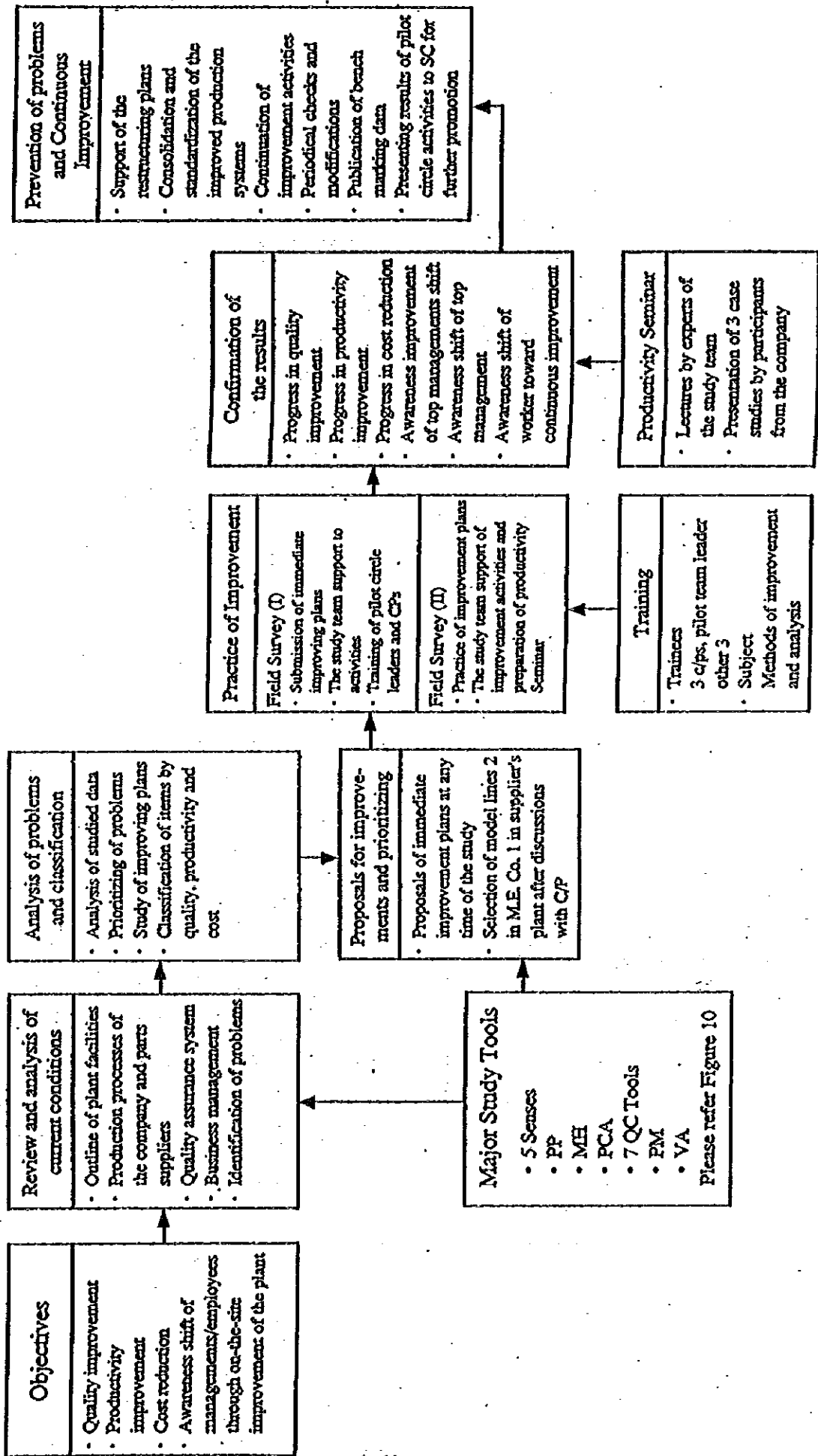
Finally, a word concerning the documents in which the improvement proposals were made. In the first study the same format was used as that used in Japan, having them make the pertinent entries after hearing explanations concerning the improvements and both me and the Company's production department head signing it. But since the entries were very long written in Polish and did not fit in the available space, it was decided to change the format in order to make it easier, and the new format was written in Polish. Both parties signed the improvement proposal documents as revised at the end of the second study, and many new proposals were also made as well as arrangements for future follow-up. The study team asked them to be sure to continue implementation on an ongoing basis without interruption for the sake of the company's development, and they agreed to do so.

Actual examples of the improvement proposal documents are given in Annex 5 in the original.

Matters made clear by the third examination are as follow:

- 1) Improvements to structured lines done up to present are arranged by four people.
- 2) We still use a parts supply shortage control chart.
 - Two companies that discovered parts supply shortage at a 0-8% rate are working towards reductions.
 - One company had an increase in parts supply shortage from 17.5-25%.
- 3) examinations of internal systems for external order products are definitely proceeding.
- 4) repainting of machinery or workbenches around the structured lines is complete.

Fig. 3-2-4 Outline of the Study: Production Technology and Management



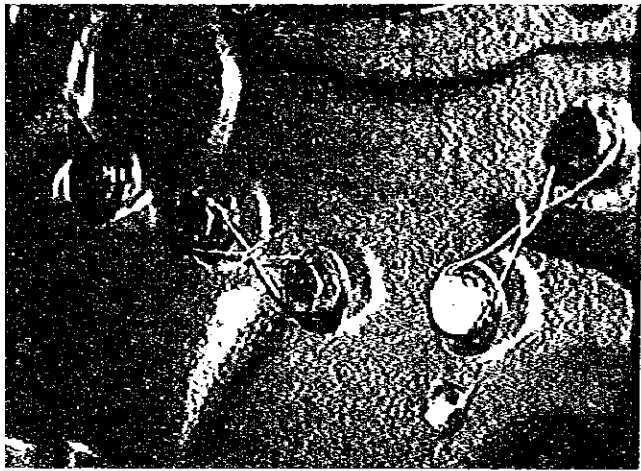


Fig. 3-2-5 Loose Fight by Wire
(Before improvement)

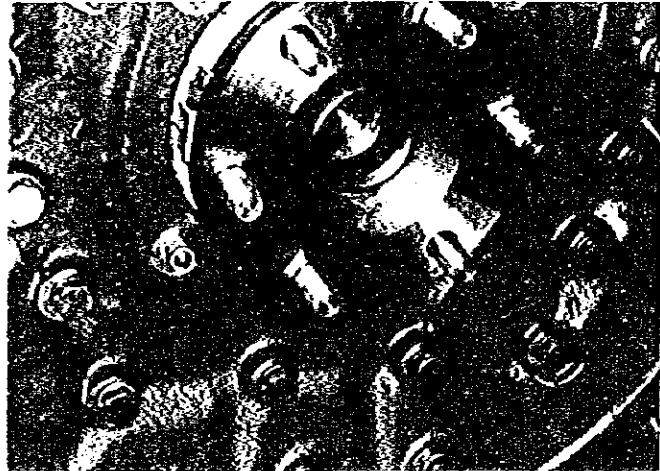


Fig. 3-2-6 Elimination of the Wire
(After improvement)



Fig. 3-2-7 Storage of Pipes
(Before improvement)



Fig. 3-2-8 Storage of Pipes
(After improvement)



Fig. 3-2-9 Oil Cleansing Cell for Bearings with a Level Gage

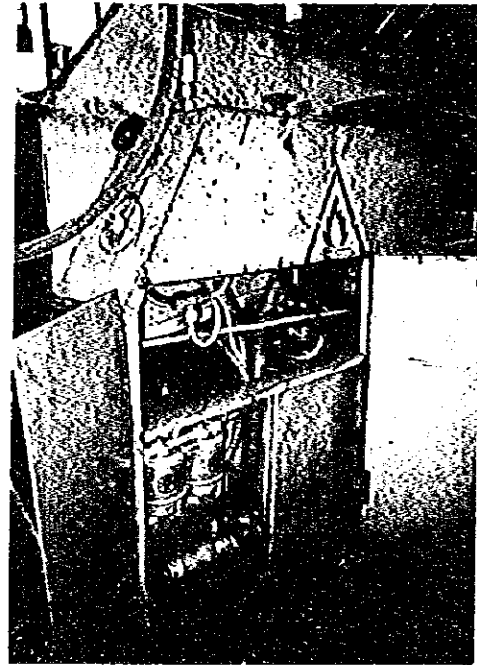


Fig. 3-2-10 Oil Cleansing Cell for Crankshafts with Oil Filters

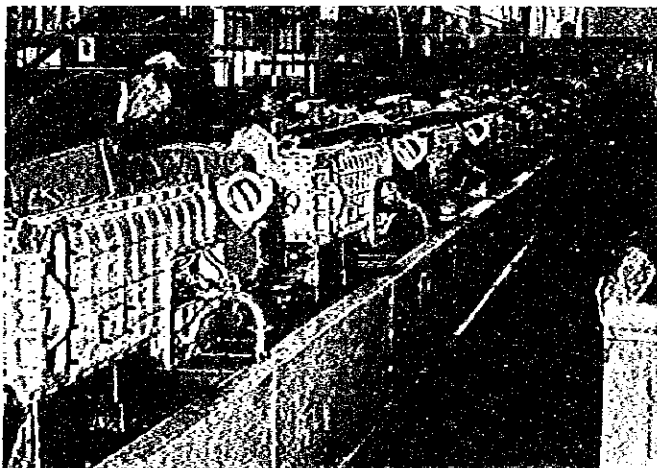


Fig. 3-2-11 Engine Assembly Line Before Improvement



Fig. 3-2-12 Engine Assembly Line After Improvement

3.2.3 Achievements of the Improvement Activities

There were two aspects of improvement activities this time: the productivity improvement activities of the company's improvement activity team members (reduction of parts supply shortage by 50%) and the study team's urgent proposal activities.

Since such activities are an area of work that they had never experience before in the company, we recognized the great importance of first maneuvering behind the scenes in order to get them to accept it without resistance.

The fact that a start was made on the basis of acceptance and understanding by all those concerned, from the company's top management to its labor union officials and even its general employees, was a big factor leading to the success that it turned out to be. However, because of that the start was delayed for approximately two weeks, and it was not possible to tell the outcome yet when the first part of the study ended, it therefore having been necessary to leave further study and implementation of improvements up to them while we are gone in the interim up to the second part of the study. But it later turned out that they did continue the activities well in response to the energetic efforts of the director in charge of production.

As for the urgent proposals, the goals were just about attained and much was achieved in the activities according job classification, but in the circle activities, the work progressed only up to collection of data since there was inadequate understanding of "QC story" up to the second part of the study. But in the second part of the study they concentrated on sorting out and analyzing that data, and the team managed to get the results aimed at with good team work and cooperation and also did a good job of announcing them at the reporting session.

3.2.4 Remaining Problems

(1) Taking Root of Improvement Activities

The activities up to now are still in the realm of "learning." Activities are needed for understanding of the essence of improvement and spreading it throughout the workplace. Such follow-up is extremely important, and it is no exaggeration to say that the company's future depends on how it is gone about.

Even in Japan a specialist consultant comes to the company at least once a month, always gives "homework" to be completed by his next visit and follows up the results.

That process is repeated over and over for about two years before real progress is attained, it being impossible to make progress all at once.

If one is serious about improvement at Mielec Engines, it will be necessary for guidance in repeated visits although they may be short.

Furthermore, if Mielec Engines is in earnest about working for improvements, it is also important that it have budget planning for the necessary guidance, and it seems to us that efforts should be made to achieve results in that way in coordination with assistance plans on the Japanese side.

(2) Specific Improvement Activities

The improvement activities concerning the problem of defects on the assembly line have ended where only the direction of countermeasures has been indicated, and it is still necessary to study and coordinate measures with the different sections and work positions and move forward to implementation of specific countermeasures.

We would also like to propose commencement of action for the purpose of making improvement activities take root, including the setting of goals, in general line improvement planning, concerning such things as number of cases of improvement in each period and improvement effects and having the different sections compete with one another regarding improvement activities. It is to be hoped that the top management of Mielec Engines will resolve to do that.

3.3 Findings of Diagnosis of Plant Management Conditions

In Japan plant diagnosis check lists are used as information for determining the plant management conditions of one's own company and companies cooperating with it.

In this case the purposes have been evaluation of the degrees of improvement in the first and second studies and provision of guidance for this kind of work as a method of management.

Since there has been some change in the content between the first study and the second study, the present evaluation has been made after making the necessary adjustment between the two.

Furthermore, for the purpose of implementation at the Company as well, at the time of the second study a check list in the Polish language was prepared. On the basis of it the director in charge of production and the production department head were asked to make their own evaluation after listening to my summary explanation, and I later added my evaluation, with clear indication of any differences. Afterwards I explained the reasons to their satisfaction.

The differences between the two evaluations as grouped in major items were as follows:

Item	Check item No.	Evaluation points (for reference)			Notes
		Study team in 1st study	Study team in 2nd study	The Company	
Policy management	12	38.3	40.0	71.7	There are policies but no goals
Quality control	6	56.7	53.7	73.3	Implementation is good, but keeping of records is inadequate
Physical control of parts, etc.	5	48.0	53.3	56.7	Progress has been made
Process control	8	42.5	52.5	82.5	Improvement team activities have had an effect
Equipment management	6	43.3	66.7	73.3	There is hope if greater maintenance efforts are made
Orderliness	6	56.7	66.7	56.7	The efforts made have produced visible results
Overall	43	45.6	52.3	70.0	Steady improvement is being made

In such evaluation there is always a tendency for evaluation of oneself to be higher. That is because in evaluation by someone else it is not necessarily the overall picture that is taken into account. Bad aspects receive more attention than good aspects since the intention of the evaluator

is to put the spotlight on what needs to be improved so that measures can be devised for that purpose. I explained that at the final meeting with The Company and in the steering committee in an effort to avoid misunderstanding concerning that.

The evaluation points are ranked qualitatively as follows, and it is to be hoped that improvement efforts will be continued for attainment of higher rankings:

Under 50 points:	Not so good
60-69 points:	Not bad
70-79 points:	Good
80 or more points:	Excellent

There has already been clear improvement in the evaluation results, and it is to be expected that continuing improvement in the future will bring still better results. We believe, as the company president has said, that the Company has a bright future ahead of it if only the items pointed out by the study team are implemented and improvement activities are continued.

Table 3-3-1 showing the result of the first study, Table 3-3-2 showing the result of the second study estimated by 2 company, and Table 3-3-3 the check list in the Polish language (with the signatures of two companies) are attached for reference.

The following is an explanation, in terms of examples, of the strictness of the study team's evaluation as based on the study finding of the second part of the study.

1) Example of Policy Management

- Are there long-term (3-5 year) management plans?

Study team's evaluation: 0 points. ME's evaluation: 6 points.

A precondition is that assessment criteria be clearly indicated in plans. In meetings with the company president and other top management figures we were told they are formulating only annual plans because there are too many changes in long-term planning in the company's present situation and it is impossible to manage them on a long-term basis. The study team's evaluation of 0 points for this item was given in view of the fact that one of the key points of the present restructuring plans is formulation of long-term plans.

- Targets too easy? (QCD)

Study team's evaluation: 4 points. ME's evaluation: 8 points.

The criterion of evaluation is an improvement goal of at least 3% over the previous period. In Company's case no specific target figures are indicated in the documents. There is some explanation of them in talk, but the basis is often not very clear. For instance, in inventory reduction activities we were given the figure of "quantity for 2 weeks" by the company president. The people on the lines know that figure, but in actual practice the inventory is enough for 1-2 months, and there are no documents controlling that to be seen on the lines.

Furthermore, there is no evidence of measures such as specifically who is to do what by when for attainment of the goals. In short, the problem is that the methods of target control have not yet taken root. That is the reason for the study team's harsh evaluation concerning this point.

2) Example of Process Control

- Are shipments made on the basis of "standard number of hours x volume of production"?
Study team's evaluation: 4 points. ME's evaluation: 8 points.

The situation would seem to be good in this respect since figures are set for standard quantities, personnel assignment, number of units produced, etc., but we frequently saw situations in which no big fuss was made when not a single unit came off the line for three days because of line stops due to on-line defects and other reasons. One can only conclude that the situation is one in which defects do not come to the surface as a big problem because of the considerable "buffer" inventory on the line.

Furthermore, there is the fact that standard time is being used only for calculation of cost and is not being used directly in production. The study team's severe evaluation of this item is based on the desire to focus attention on the problem so that it will be taken up as a matter for which improvement measures are necessary.

- 3) On the other hand, there was not much of a difference between the two sides in evaluation of quality control, control of identification of items in process, equipment control, etc., often not greater than 1 point. We hope they will understand that the aim is to make assessment clearly visible in control diagrams and other documents so as to make it easier to take steps to solve problems and not just good implementation.

**Table 3-3-1 Check List for State of The Company's Production Process and Quality Control
Evaluation carried out September 20, 1996, by Study Team (Miyakawa)**

(Translator's remark: same as above (Sept. 20), except for points)

- 10 points: Thorough overall implementation
- 8 points: Good implementation or understanding
- 6 points: Fair Implementation or understanding
- 4 points: Only limited implementation
- 2 points: Some signs of implementation, but inadequate

	Check item	Evaluation points						Evaluation standards	
		10	8	6	4	2	0		
P o l i c y	Is there a long-term (3-5 year) business plan?						☆	Indicated in plan	Means and measures Formulation of basic policies
	Is there a president's annual business plan (for each period)?				☆			Indicated in plan	Formulation of basic policies
	Are the policies broken down by department and section?					☆		Indicated in plan broken down by department and section	Formulation of annual plan
	Are policies for the present period set on the basis of the actual results of the preceding period?					☆		Clear actual results of preceding period and aim	Drawing up of profit plan for the present period
	Is confirmation made each month of progress made with respect to policy?						☆	Yes	Promotion committee, etc.
	Are the targets not too low? (QCD)				☆			At least 3% higher than the preceding period	Formulation of plan for specific developments
	State of preparation of new product development system				☆			Arrangements for coordination between departments	Development committee, etc.
	State of preparation of quality assurance system				☆			Arrangements for coordination between departments	Quality assurance committee, etc.
	State of preparation for undergoing ISO-9001 examination				☆			Arrangements for coordination between departments	ISO committee, etc.
	Arrangements for guidance of manufacturers with which orders are placed					☆		Overall QCD	Guidance standards
State of implementation of in-house employee education and training (QC, safety, top management, middle- and lower-level managers, staff, etc.)		☆					Training manuals and policies	Training committee, etc.	
State of preparation and daily maintenance of cost management					☆		Individual cost prices and flow systems	Management club, cost committee	
Subtotal according to study team		8	13	16	6		46/120=38.3		
Subtotal according to the study team		20	40	18	8		86/120=71.7		
ME's subtotal									

	Check item	Evaluation points				Evaluation standards		
Q u a l i t y C o n t r o l	Is there control of important parts?		☆			Observance of the rules	Setting of control standards	
	Is there a clear distinction between sampling inspection and 100% inspection?	☆				Clear indication of difference (in work standards, etc.)	Inspection standards	
	Is the situation regarding defects up to the day before known, and have measures been taken to cope with them?				☆	Indicated separately for each line, with indication of countermeasures, too	Statistical data	
	Is process capacity accurately known?					☆	Control charts, CP values	Daily control
	Arrangements for guidance of companies with which outside orders are placed in case of occurrence of defects			☆			Implementation of appropriate measures	System of monthly defect log and reporting
	Is there appropriate control of measuring apparatus?		☆				Observance of the rules	Control ledger and content thereof
	Subtotal according to the study team		16	12		2	0	30/60=50,0
ME's subtotal								
P a r t s C o n t r o l	Is it clear from day to day what quantities of materials, parts, work in process and finished products are to be found at what places?			☆		Posting of such information, including history of changes	Parts "pull down" and treatment of defects	
	Can anyone tell if there are unneeded materials, unneeded inventory parts, etc.?			☆		Place for placement of unneeded materials, etc. and marking as such	25/ 26/ 27/ 28/ Drawing of boundary lines and use of tags	
	Are there any materials or parts for which there are no work instructions?				☆	Provision of such instructions within 2 days		
	Is there (insuu=?) quantity control?				☆	Control of organized method of placement	Standard boxes, standard pallets	
	Are the stock quantities suitable?				☆	Standard quantities	Lot sizes	
	Subtotal according to study team			12	12			24/60=40,0
ME's subtotal								

	Check item	Evaluation points				Evaluation standards		
P r o d u c t i o n C o n t r o l	Is removal of materials from the warehouse determined by standard time x production quantity?				☆	Standard quantities	Personnel distribution and number of production machines	
	Is efficiency known on a day-to-day basis?				☆	Posting of data	Actual production figures and downtime	
	Is recovery capacity strong in case of occurrence of nonconformities?			☆		Recovery before assembly	Measures for coping with in-process defects	
	Is the line such that line balance can be absorbed?		☆			Assignment of personnel with multiple skills	Multiple-skill schedule	
	Is the line stopped when anomalies occur?				☆	Capable of control by equipment	On lines with multiple machines	
	Do the operators also carry out inspection work?		☆			Up to entry in control chart	QC education (statistical viewpoint)	
	Are capacity and actual production clearly known by separate processing lines?				☆	Indication by separate lines	Control clubs	
	Is there control of setup time?				☆	Indication for each separate machine	Setting of standard times	
Subtotal according to study team			16	6	4	8	34/80=42.5	
ME's subtotal								
E q u i p m e n t M a n a g e m e n t	Is the state of operation of the equipment good?				☆	Daily control of rate of operation	Control clubs	
	Are maintenance and repairs carried out as they should be?				☆	Maintenance and repair records	Planned management schedule	
	Is there good coordination with the work?				☆	Observance of standard times	Standard time chart	
	Is progress being made in automation?				☆	Relationship between machine itself and means of transfer	Automation and multiple-machine control	
	Are jigs and tools well devised?			☆		Setting of changing times	Control of standard times	
	Have safety measures been devised?			☆		Safety education and posting of safety rules	State of provision of guard screens	
Subtotal according to study team			12	2	2		26/60	43.3
ME's subtotal								

	Check item	Evaluation points					Evaluation standards	
		☆						
A r r e n g e m e n t	Is a distinction made between corridors and work spaces?	☆					Clear indication of distinction	Use of yellow lines
	Is a clear distinction made between places for keeping in-process work and places for keeping defective units?				☆		Observance of the rules	Use of white lines and red lines and standards
	Are there no superfluous parts, tools, etc. on the work tables?			☆			By direct observation on the lines	Clear indication of proper places for keeping different things (shadow pictures, etc.)
	Are pallets placed properly?				☆		Placement within zones	Marking of zones by lines and use of standards
	State of orderliness of accessories, tools, measuring devices, etc. of the machinery				☆		Dust, fouling, fixed positions	Rules such as "5-minute tidying up"
	Orderliness of shelves and accessory tables			☆			State of parts and accessories inside and outside	Setting of standards
	Subtotal according to study team	10		12	12		34/60	66.7
	ME's subtotal							
	Total according to study team	10	40	65	60	20	196/430	Overall points: 45.6
	ME's total							

Table 3-3-2 Check List for State of MB's Production Process and Quality Control
Evaluation carried out September 20, 1996, by Study Team (Miyakawa)
by ME (Mr. R. Sierak, Mr. E. Cabaj)

(Translator's remark: same as above (Sept. 20), except for points)

- 10 points: Thorough overall implementation
- 8 points: Good implementation or understanding
- 6 points: Fair implementation or understanding
- 4 points: Only limited implementation
- 2 points: Some signs of implementation, but inadequate

	Check item	Evaluation points					Evaluation standards	Means and measures
		10	8	6	4	2		
P o l i c y M a n a g e m e n t	Is there a long-term (3-5 year) business plan?			*		*	Indicated in plan	Formulation of basic policies
	Is there a president's annual business plan (for each period)?			*	*		Indicated in plan	Formulation of basic policies
	Are the policies broken down by department and section?				*	*	Indicated in plan broken down by department and section	Formulation of annual plan
	Are policies for the present period set on the basis of the actual results of the preceding period?		*			*	Clear actual results of preceding period and aim	Drawing up of profit plan for the present period
	Is confirmation made each month of progress made with respect to policy?	*				*	Yes	Promotion committee, etc.
	Are the targets not too low? (QCD)		*		*		At least 3% higher than the preceding period	Formulation of plan for specific developments
	State of preparation of new product development system	*			*		Arrangements for coordination between departments	Development committee, etc.
	State of preparation of quality assurance system		*	*			Arrangements for coordination between departments	Quality assurance committee, etc.
	State of preparation for undergoing ISO-9001 examination		*	*			Arrangements for coordination between departments	ISO committee, etc.
	Arrangements for guidance of manufacturers with which orders are placed				*	*	Overall QCD	Guidance standards
	State of implementation of in-house employee education and training (QC, safety, top management, middle- and lower-level managers, staff, etc.)		*	*			Training manuals and policies	Training committee, etc.
	State of preparation and daily maintenance of cost management			*	*		Individual cost prices and flow systems	Management club, cost committee
	Subtotal according to study team		8	11	24	4	48/120=40.0	
ME's subtotal		20	40	18	8	86/120=71.7		

	Check item	Evaluation points					Evaluation standards	
		*	☆	☆	☆	☆		
Q u a l i t y C o n t r o l	Is there control of important parts?			☆			Observance of the rules	Setting of control standards
	Is there a clear distinction between sampling inspection and 100% inspection?	☆	☆				Clear indication of difference (in work standards, etc)	Inspection standards
	Is the situation regarding defects up to the day before known, and have measures been taken to cope with them?	☆			☆		Indicated separately for each line, with indication of countermeasures, too	Statistical data
	Is process capacity accurately known?				☆	☆	Control charts, CP values	Daily control
	Arrangements for guidance of companies with which outside orders are placed in case of occurrence of defects			☆	☆		Implementation of appropriate measures	System of monthly defect log and reporting
	Is there appropriate control of measuring apparatus?		☆	☆			Observance of the rules	Control ledger and content thereof
	Subtotal according to the study team		16	6	8	2	32/60=53,7	
ME's subtotal		20	8	12	4	44/60=73,3		
P a r t s C o n t r o l	Is it clear from day to day what quantities of materials, parts, work in process and finished products are to be found at what places?		☆	☆			Posting of such information, including history of changes	Parts "pull down" and treatment of defects
	Can anyone tell if there are unneeded materials, unneeded inventory parts, etc.?			☆	☆		Place for placement of unneeded materials, etc. and marking as such	25/ 26/ 27/ 28/ Drawing of boundary lines and use of tags
	Are there any materials or parts for which there are no work instructions?				☆	☆	Provision of such instructions within 2 days	
	Is there (insuu=?) quantity control?		☆	☆			Control of organized method of placement	Standard boxes, standard pallets
	Are the stock quantities suitable?				☆	☆	Standard quantities	Lot sizes
Subtotal according to study team		16	12	4		32/60=53,3		
ME's subtotal		16	18			34/60=56,7		

	Check item	Evaluation points				Evaluation standards	
		*	☆				
P r o c e s s C o n t r o l	Is removal of materials from the warehouse determined by standard time x production quantity?	*		☆		Standard quantities	Personnel distribution and number of production machines
	Is efficiency known on a day-to-day basis?	*		☆		Posting of data	Actual production figures and downtime
	Is recovery capacity strong in case of occurrence of nonconformities?			☆	☆	Recovery before assembly	Measures for coping with in-process defects
	Is the line such that line balance can be absorbed?	*		☆		Assignment of personnel with multiple skills	Multiple-skill schedule
	Is the line stopped when anomalies occur?	*		☆		Capable of control by equipment	On lines with multiple machines
	Do the operators also carry out inspection work?			☆	☆	Up to entry in control chart	QC education (statistical viewpoint)
	Are capacity and actual production clearly known by separate processing lines?	*		☆		Indication by separate lines	Control clubs
	Is there control of setup time?			☆	☆	Indication for each separate machine	Setting of standard times
Subtotal according to study team				30	12	42/80=52.5	
ME's subtotal		30	24	12		66/80=82.5	
E q u i p m e n t M a n a g e m e n t	Is the state of operation of the equipment good?			☆	☆	Daily control of rate of operation	Control clubs
	Are maintenance and repairs carried out as they should be?			☆	☆	Maintenance and repair records	Planned management schedule
	Is there good coordination with the work?	*		☆		Observance of standard times	Standard time chart
	Is progress being made in automation?			☆	☆	Relationship between machine itself and means of transfer	Automation and multiple-machine control
	Are jigs and tools well devised?	*		☆		Setting of changing times	Control of standard times
Have safety measures been devised?	*		☆		Safety education and posting of safety rules	State of provision of guard screens	
Subtotal according to study team				8	24	8	40/60=66.7
ME's subtotal		33	24	12		44/60=73.3	

	Check item	Evaluation points						Evaluation standards	
		*	☆						
A r r a n g e m e n t	Is a distinction made between corridors and work spaces?	*	☆					Clear indication of distinction	Use of yellow lines
	Is a clear distinction made between places for keeping in-process work and places for keeping defective units?		*	☆				Observance of the rules	Use of white lines and red lines and standards
	Are there no superfluous parts, tools, etc. on the work tables?			☆	*			By direct observation on the lines	Clear indication of proper places for keeping different things (shadow pictures, etc.)
	Are pallets placed properly?			☆	*			Placement within zones	Marking of zones by lines and use of standards
	State of orderliness of accessories, tools, measuring devices, etc. of the machinery		*			*		Dust, fouling, fixed positions	Rules such as "5-minute tidying up"
	Orderliness of shelves and accessory tables			☆	*			State of parts and accessories inside and outside	Setting of standards
	Subtotal according to study team		16	24				34/60=66,7	
	ME's subtotal	30	8		16			34/60=56,7	
	Total according to study team		64	308	62	6	0	230/440=52,3	Overall points: 44,7
	ME's total	80	128	72	28	0	0	308/440=70,0	Overall points:

Table 3-3-3

Procesy produkcji i zarządzanie jakością w Wytwórni Silników PZL-Mielec. ANKIETA

Ocena	* całkowicie wdrożone.....	10 punktów
	* wdrożone lub znane.....	8 punktów
	* wdrożone lub znane do pewnego stopnia.....	6 punktów
	* wdrożone częściowo.....	4 punkty
	* istnieje oznaki wdrażania, ale nie jest ono wystarczające..	2 punkty

	Przedmiot badań	Ocena					Kryterium oceny (10 punktów)	Podjęto środki
		10	8	6	4	2		
	Istnieje długoterminowy (3-5 lat) plan zarządzania			X			Jasno określony w planie	Ustalenie podstawowych kierunków działania
	Istnieje opracowany przez prezesa firmy roczny plan zarządzania			X			Jasno określony w planie	Ustalenie podstawowych kierunków działania
	Z planem zostały zapoznane wszystkie działy				X		Jasno określony w planie opracowany w każdym wydziale	Opracowanie planu rocznego
	Plan na okres bieżący został opracowany w oparciu o plan poprzedni		X				Jasne są osiągnięcia i cele poprzedniego planu	Ustalenie planu zysków na bieżący okres
Kontrola kier. dział. firmy	Co miesiąc sprawdza się jak postępuje realizacja planu	X					Wdrożone	np. Komisja ds. Kontroli Realizacji Planu
	Wytyczony cel jest zbyt łatwy do osiągnięcia	X					Powyżej trzech procent więcej w porównaniu z poprzednim planem	Ustalenie konkretnego planu rozwoju
	Opracowanie nowego systemu rozwoju produktów	X					Koordynacja działań w poszczególnych wydziałach	np. Komisja ds. Rozwoju
	Opracowanie nowego systemu jakości	X					" "	np. Komisja ds. Zapewnienia Jakości
	Przygotowanie do ISO-9001	X					" "	np. Komisja ds. ISO
	System szkolenia dostawców z zewnątrz				X		Cały system QCD (jakość koszty, dostawa)	Standardy szkolenia
	System szkolenia wewnątrz firmy (kontrola jakości, bezpieczeństwo, dyrektor, zarząd, pracownicy)	X					Podreczniki szkoleniowe	Komisja ds. Szkolenia

Przedmiot badan	Ocena		Kryterium oceny	Podjete sredki	
	10 8 5 4 2 0				
Zarzadzanie kosztami wlasnymi i system utrzymania ruchu	X	V	Koszty wlasne pojedyn. wyrobow. system kontroli dostaw	Wykres kontrolny, Komisja ds. Kosztow Wlasnych	
Misja japonska - Razem	8	12/16	6	$42/120 = 35,0\%$	
PZL-Mielec - Razem	20	40/18	8	- $86/120 = 71,7\%$	
Razne czesci maszyn sa kontrolowane	XV			Przestrzezenie zasad	
Wyraznie odrozni sie kontrole wyrywkowa od calosciowej	X	V		Jasne okreslenie wymogow kazdej inspekcji (rowniez norma pracy)	
Znany jest stan wadliwych produktow do dnia poprzedniego i podejmowane sa srodki zaradcze	X	.	V	Rejestr defektow na kazdej linii z osobna i opis srodkow zaradczych	
Moc produkcyjna jest w pelni wykorzystana		X	V	Schemat zarzadzania, wartosc mocy produkcyjnej	
System kontrolowania dostawcow w przypadku pojawienia sie defektow		X	V	Wprowadzenie srodkow zaradczych	
Wlasciwa jest kontrola przyrzadow pomiarowych	V	X		Przestrzezenie zasad	
Misja japonska - Razem	16	6	8	Z	$32/60 = 53,3\%$
PZL-Mielec - Razem	20	8	12	4	- $44/60 = 73,3\%$
Zawsze wiadomo gdzie i ile jest materialow. czesci. produktow w toku i produktow gotowych	X	V			Dokumentacja wszelkich zmian
Wazyscy pracownicy wiedza, ile jest nieuzywanych materialow i zapasowych czesci		X	V		Magazynowanie czesci nieuzywanych. dokladny opis
Nie ma materialow ani czesci, ktore nie maja zalezonej instrukcji obslugi		V			Nie dluzej niz dwa dni
Ilosc produktow jest kontrolowana	V	X			Kontrola sposobu skladowania zapasow
Ilosc zapasow jest prawdziwa		X	V		Standardowa ilosc
					Znormalizowane skrzynie i pakiety
					Wyroby pakowane w partiach

Zarząd. wyosaz.	Przedmiot badań	Ocena										Kryterium oceny	Podjęte środki			
		10	8	6	4	2	0									
	Misja japońska - Razem PZL-Mielec - Razem		16	12	4											
	Produkty pobierane są z maszyny w proporcji do standardowego czasu i wielkosci produkcji	X														
	Znana jest dzienna wydajnosć maszyn i ludzi	X														
	Sprawnio usuwane są wszelkie niezgodnosci produktow															
Zarząd. procesen prod.	Linia produkcyjna zapewnie zachowanie równowagi w procesie produkcji. Gdy powstanie defekt produktow, linia produkcyjna staje się	X														
	Operator maszyny jest jednoczesnie jej inspektorem															
	Znana jest wydajnosć kazdej linii obrobkowej z osobna	X														
	Kontrolowany jest czas potrzebny na przygotowanie															
	Misja japońska - Razem															
	PZL-Mielec - Razem		30	24	12											
	Wlasciwa jest eksploatacja wyosazania															
	Wlasciwie prowadzone są remonty i naprawy															
Zarząd. wyosaz.	Kolejne operacje są ze sobą powiazane w wlasciwy sposób	X														
	Wprowadza się automatyzacje produkcji															

Przedmiot badań	Ocena							Kryterium oceny (10 punktów)
	10	8	6	4	2	0		
Sprawno są narzędzia i urządzenia	✓						0	Podjęte brodki Kontrola standardowego czasu
Przebieg dot. bezpieczeństwa pracy są jasno określone	X							Ustalenie czasu wymiany
Misja Japońska - Razem	8	18	8					Szkolenie BHP, opis na tablicy jasnego bezpieczeństwa pracy
PZL-Mielec - Razem	32	12						$34/60 = 56.7\%$ $44/60 = 73.3\%$
Przejęcia są wyraźnie odroznione od miejsc pracy	X	✓						Szczegółowy opis
Miejsca przechowywania produktów w toku i produktów wyprodukowanych są wyraźnie oddzielone	X	✓						Oddzielenie przebieg kolejnymi liniami
Nie ma zbędnych części i narzędzi w miejscu pracy		✓	X					Oddzielenie białymi i czerwonymi liniami
Palety są układane we właściwy sposób								Jasno określenie miejsc przechowywania poszczeg. przedmiotów (obrys, kształt.)
Porządek i koordyn.		✓	X					Oznaczenie sekcji liniami przy użyciu standardowych opisów
Części zapasowe maszyna, narzędzia i przyrządy pomiarowe są używane we właściwy sposób	✓			X				Wprowadzenie reguł np. 5 min. porządków
Części na półkach i postumentach leżą na swoich miejscach			✓	X				Określenie norm.
Misja Japońska - Razem	16	24						
PZL-Mielec - Razem	10	8		16				$40/60 = 66.7\%$ $34/60 = 56.7\%$
MISJA JAPONSKA - OGOLEN	64	102	48	8				$222/430 = 51.6\%$
PZL-MIELEC - OGOLEN	80	120	72	28				$308/430 = 71.6\%$
								Całkowita ilość punktów Całkowita ilość punktów



3.4 State of Implementation of Productivity Improvement Seminar

Schedule and Results of Survey by Questionnaire

The productivity improvement seminar was held as scheduled on December 3, 1996. On that day all large number of guests participated, including a representative of the Ministry of Commerce and Industry in representation of the Polish Government, Third Secretary Kumaya from the Japanese Embassy and Mr. Umibori, and therefore the seminar was held separately for MB employees the day before.

The content was the same both days. The schedule was as indicated below. The letter of invitation sent to each participant is given in Fig. 3-4-1.

I will go into the details later, mentioning now only the fact that the seminar was a big success on both days.

(1) Schedule

8:00-9:00	Productive Maintenance Seminar	Instructor: Hideo Tashiro, SAIES
9:00-9:30	Report on Activities of Machining Improvement Team	Instructor: S378 R. Lato
9:45-10:45	Improvement Activities Seminar	Instructor: Naohisa Miyakawa, SAIES
10:45-11:15	Report on Activities of Assembly Improvement Team	Instructor: S680 Z. Kolodziej
11:15-11:45	Review	Instructor: WSP800, R. Sierak
11:15-12:15	Addresses by Guests	

(2) Results of Survey by Questionnaire

Before the seminar started, a questionnaire in Polish (Table 3-4-1) was handed out, and everyone was requested to fill it in. The totalization results are given in Table 3-4-2 in Japanese. For reference, the questionnaire in Japanese is appended to Table 3-4-3. On the first day the respondents were requested to give their names, but on the second day they were requested to remain anonymous. Since there was no difference between the two days in terms of the results. The responses were evaluated together.

The audience listened very attentively, and the atmosphere was such as to make it very easy for the speakers to talk. The evaluation "3" (the highest) was given by most respondents for all items, and therefore the seminar can be said to have been a success.

Some constructive opinions were also expressed, such as the wish that texts and other information might be made available to those who desired them and the wish that improvements regarding the offices and not just production lines also be considered.

AGENDA:

Time :	Subject :	Lecturer :
1 st - 9 th	PRODUCTION CONTROL	SYES Co., Ltd. Mr. H. Tachiro
9 th - 10 th	QUALITY CONTROL PRODUCTIVITY IMPROVEMENT	SYES Co., Ltd. Mr. N. Miyakawa
10 th - 10 th	REPORT ON CYLINDER BLOCK PRODUCTION LINE - 50 % REDUCTION OF CYLINDER BLOCK INVENTORIES	Engies Co., Ltd. Mr. R. Lato
10 th - 11 th	REPORT ON ENGINES ASSEMBLY LINE IMPROVEMENT OF ELEMENTS DELIVERY FOR ASSEMBLY LINE	Engies Co., Ltd. Mr. Z. Kolobzief
11 th - 11 th	SUMMARY	Engies Co., Ltd. Mr. R. Siczak

**SYES Co., Ltd. and „PZL - Mielec” Engines Co., Ltd.
HAVE HONOUR TO INVITE**

Mr. Naohisa MIYAGAWA
Production Technology (SYES Co., Ltd.)

**TO TAKE PART IN SYMPOSIUM
„ RESTRUCTURING PROCESS OF
„ PZL - Mielec ” Engines Co., Ltd. ”**

**THE SYMPOSIUM WILL TAKE PART IN MIELEC, 3 WOJSKA
POLSKIEGO STR., ON DECEMBER 3, 1996, AT 8⁰⁰ A.M.**

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Fig. 3-4-1 Invitation Card for Productivity Seminar



Fig. 3-4-2 A Scene of the Productivity Seminar

Table 3-4-1

ANKIETA

Szanowni Państwo!

Dziękujemy serdecznie za uczestnictwo w dzisiejszym seminarium o produktywności. Pragniemy zapoznać, jak Państwo przyjęli taką formę zorganizowania spotkania, treść referatów czy w ogóle proponowaną przez nas ideę "Kaizen". Jesteśmy bardzo zainteresowani poglądami Państwa na ewentualną przydatność działalności korekcyjnej w Polsce: czy mogłaby ona znaleźć zastosowanie także w zakładach Państwa, czy to będzie możliwe w najbliższych czasach... Prosimy zatem, aby Państwo zechcieli wypełnić poniższe rubryki swoimi oceniami.

I O efektywność organizacji seminarium

Skala ocen - 3: dobry lub w dużym stopniu,

2: dostateczny lub w średnim stopniu,

1: niedostateczny lub w niskim stopniu.

- (1) Jak Pan / Pani ocenia wybór tematu oraz materiały prezentacyjne dla dzisiejszego seminarium?
(3 2 1)
- (2) Czy właściwy był podział czasu na poszczególne części seminarium poświęconym osobnym zagadnieniom?
(3 2 1)
- (3) Czy same zagadnienia poruszone w referatach były dla Pana / Pani przyswajalne?
(3 2 1)
- (4) Jak Pan / Pani ocenia sposób omawiania tych zagadnień? Czy był on dostatecznie klarowny i interesujący?
(3 2 1)
- (5) Czy zrozumiał(a) Pan / Pani kolejność działań pracowników-uczestników programu korekcyjnego?
(3 2 1)
- (6) Czy Pana / Panią zainteresowały referaty wygłoszone przez członków zespołu korekcyjnego w Wytwórni Silników?
(3 2 1)
- (7) Czy Pan / Pani ma zamiar zastosować działalność "Kaizen" we własnym przedsiębiorstwie?
(3 zaraz 2 z czasem 1 nie mam zamiaru)
- (8) Czy chciał(a)by Pan / Pani wziąć udział w następnej edycji seminarium?
(3 chętnie 2 raczej tak 1 nie)

II Uwagi ogólne o seminarium

Oczekujemy od Pań / Pani różnych innych opinii odnoszących się do dzisiejszego seminarium... Które z wielu zagadnień poruszonych w referatach najbardziej Pana / Pani zainteresowało?.. Wszelkiego rodzaju szczere i konkretne uwagi będą dla nas ogromnie przydatne.

Uprzejmie dziękujemy za odpowiedź.

Imię i nazwisko:

Przedsiębiorstwo:

Stanowisko pracy:

Table 3-4-2

Report on Results of Totalization of Responses to the Questionnaire on the Production Improvement Seminar

Dec. 3, 1996

Question item	Evaluation		
	3	2	1
What do you think of the setting of themes, information and method of implementation of the seminar?	37	6	1
How about the time distribution over the different themes?	29	10	
Did you understand the content of each theme?	35	7	
Were they easy to understand and interesting?	37	5	
Did you understand the ways in which the improvements are being made?	37	5	
Did you find the expressions of opinion by ME's circles interesting?	36	6	
Are you interested in applying what you have heard to your own company?	31	10	
Would you like to have more seminars like this one in the future?	35	8	

- Notes:
1. The respondents were those who participated in the seminar either on December 2 or December 3 (the total number of respondents being 43).
 2. For all of the items most respondents answered "3", which is an indication that the seminar was a success.
 3. The first day the respondents were asked to give their names, but the second day they were asked to remain anonymous. However, the results were the same.
 4. Opinions expressed by respondents:
 - It would have been better to have texts and written materials.
 - It would be interesting to hear about how to make improvements in offices as well as at plants.

Table 3-4-3 (Questionnaire written in Japanese; translated in English)

(date)

Request Concerning Questionnaire on "Productivity Improvement Seminar"

We would appreciate it if you would take the time to fill out this questionnaire, with expression as well of any opinions or desires that you have concerning the content of the seminar, since we would like to use the results for reference purposes regarding whether or not the seminar has given you any insights concerning your work and whether or not the content thereof might be of use to you in your future work.

1. Questionnaire Concerning the Results of Participation in the Seminar

For each question item please circle 3 (Good), 2 (Fair) or 1 (Rather inadequate) as your evaluation.

Question item	Evaluation		
1. What do you think of the setting of themes, information and method of implementation of the seminar?	3	2	1
2. How about the time distribution over the different themes?	3	2	1
3. Did you understand the content of each theme?	3	2	1
4. Were they easy to understand and interesting?	3	2	1
5. Did you understand the ways in which the improvements are being made?	3	2	1
6. Did you find the expressions of opinion by ME's circles interesting?	3	2	1
7. Are you interested in applying what you have heard to your own company?	(immedi- ately) 3	(sometime later) 2	(never) 1
8. Would you like to have more seminars like this one in the future?	(very much so) 3	(to a certain extent) 2	(no) 1

2. Comments on the Seminar as a Whole

Please concretely mention any matters in the seminar that were of particular interest to you and any other matters not dealt with by the above questions that you consider to be pertinent.

Thank you for your cooperation.

Company:	
Position:	
Full name:	

3.5 Productive Maintenance Seminar

(1) Summary Concerning Productive Maintenance

At Mielec Engines it is necessary for the cylinder blocks to go through 47 different machining processes from the input material to the finished product, and on such a continuous production machining line the quality of maintenance has an extremely big impact on productivity. As a result of the diagnosis made by the study team in the first part of the study at Mielec Engines it was determined that the large in-process volume on the line is due to the fact that the maintenance implemented on it was only breakdown maintenance. Therefore this theme was selected for the sake of working for reform of maintenance activities on the basis of examples of maintenance methods implemented in the steel industry and elsewhere. The talk was very well received by the audience because in many places it explained the content using examples of the actual situation at Mielec Engines. It can be considered to have made a considerable contribution to improvement of productivity at state enterprises in Poland. The following is a list of the main points of the talk.

1) Development of Maintenance Methods

Five stages of development of maintenance methods were indicated: breakdown maintenance (B.M.), preventive maintenance (P.M.), modificative maintenance (M.M.), productive maintenance (Prd. M.) and maintenance prevention (M.P.), it being explained that Mielec Engines was making a transition from stage one to stage two.

2) Productive Maintenance (Prd. M.) Implementation System

It was explained that all of the four functions (i) repair, (ii) inspection and planning, (iii) maintenance technology and (iv) adjustment and control must be meshed together in optimum fashion in order to make a profit, and it was pointed out that Mielec Engine had only the repair function and that it was now in the process of nurturing the inspection and planning function.

3) Maintenance Implementation Organization, Functions and Personnel

The organization and personnel (in terms of percentage) needed for implementation of the five stages of maintenance were shown, it was pointed out that the fact that the company was presently in only the first stage of maintenance cannot be helped considering its present situation regarding personnel and that an increase in personnel would be needed in order for the company to advance to stages two and three, and it was explained how that could be done.

4) Total Productive Maintenance (T.P.M.) Implementation Concept

5) Relationship Between Different Terms Concerning Maintenance

- 6) **Explanation of Steps for Introduction of Preventive Maintenance to Cylinder Block Line**
 - (1) **Repair methods and need for improvement**
 - (2) **Regular shutdown (R.S.D.) activities (what is to be done in what order)**
 - (3) **Specific content of preventive repair plans**
 - (4) **Inspection methods (method of preparation of standards and check lists, etc.)**
 - (5) **Inspect based on the "five senses" (how to check what by the human senses)**
 - (6) **Daily work of inspector (explanation in terms of specific examples)**
 - (7) **Work of maintenance engineer (explanation in terms of specific examples)**
 - (8) **Work of maintenance manager (explanation in terms of specific examples)**
- 7) **Preventive Maintenance Implementation Activities (explanation of items of what is to be implemented in terms of each of the following: PLAN, DO, CHECK, ACTION).**
- 8) **What Is Done in "5S" Activities on the Cylinder Block Line**
- 9) **Proposal for Company-Wide Adoption of Productive Maintenance at Mielec Engine**
 - (1) **Explanation that, as mentioned in 2) above, the inspection and planning function and the maintenance technology function have to be nurtured, that for that purpose it is necessary to assign one person for each of these two functions on the cylinder block line and one each to other equipment, for a total of four "inspection and planning" and "maintenance technology" person, and that one person had already begun doing "inspection and planning" work in practical terms for a start.**
 - (2) **Need to keep daily data records on trouble, repairs and cost thereof for analysis and confirmation so as to be able to determine maintenance effect.**
 - (3) **Need to establish a "Productive Maintenance Implementation Promotion Committee within the company under the company-wide restructuring committee and chaired by the director in charge of production, to have it meet once a month, to first confirm the positive results on the cylinder block line and then to have the activities adopted throughout the company.**

3.6 Report on Activities of Cylinder Block Machine Processes Improvement Team

(1) Team members: Mr. R. Lato and 4 others.

(2) Period of activities: Sept. 11 - Dec. 7, 1996

(3) Activity goals:

(a) Reduction of cylinder block machining in-process volume by 50% (60 cylinder blocks/day --> 30 cylinder blocks/day)

(b) Reduction of equipment downtime by 25% (40 h/month --> 30 h/month)

(c) Reduction of total machining time by 5%

(4) Summary description of production process

Forty-seven processes are needed to make completed cylinder blocks from the input materials. It is a so-called "continuous production line." Up until early October the production flow on the line was 60 cylinder blocks/day. There were 14 workers on it, including the work chief, with 1 shift a day. The monthly equipment downtime rate was 22.1%, and the defect rate ranged from a minimum of 10% to a maximum of 30%.

(5) Summary description of activities

Since its formation the team studied reduction of in-process volume by 50% and countermeasures concerning mainly production time losses due to equipment downtime (analysis of actually determined figures on trouble, defects, etc. and study and devising of measures) and in the period from November 19 to December 7 carried out implementation tests.

(6) Results of the team's activities

The results with respect to the three activity goals were as follows:

(a) Regarding the goal of reduction of in-process volume by 50%, the machining line was divided into three lines, A, B and C, for time observation in order to determine the time that takes to machine ten cylinder blocks within one day's actual working time, and the production system was changed to production of ten cylinder blocks each on lines A, B and C. As a result the in-process volume was reduced from 60 cylinder blocks a day to 30 cylinder blocks a day. (N.B.: The machining times for ten cylinder blocks a day were as follows: Line A, 6.5 h. Line B, 6.0 h. Line C, 7.5 h.

(b) Before the maintenance that was carried out was only breakdown maintenance, i.e. repair only after occurrence of trouble. Starting from Saturday, November 23, however, regular shutdown days were set for implementation of preventive maintenance. Inspection personnel were selected and inspection activities were started. As a result, between November 25 and December 5 there was zero trouble, the fruits of making every Saturday a regular shutdown day having emerged.

(c) The workers were reorganized from 6 teams to 2 teams that would come to each other's help when necessary, thereby reducing loss time.

After such success on the cylinder block machining line the system has also be adopted by the neighboring cylinder head line by the same way of thinking and the same method as an attempt at so-called horizontal development.

3.7 Improvement Activities Seminar

3.7.1 Outline of Improvement Activity Seminar (person in charge: Miyakawa)

In my talk at this productivity improvement seminar it was my intention to stress the importance of implementation of improvement on the basis of cooperation between the Company's top management and all of its employees from the outstart since, in my opinion, drastic measures for improvement of productivity are needed and implementation of rationalization activities is essential in order for the company to be able to achieve its restructuring plans.

It has not been long since the Company made the switch from the system under the Communist regime, and the biggest problem that emerged over and over again in my discussions with its top management during the first study was the fact that when top management gives instructions, those below tend to resist them, making it necessary to ASK them to do something instead of ORDERING them to do so. I decided on the theme of my symposium talk on the basis of the conviction that in view of the importance of resolving such a situation, it was necessary to obtain their full understanding, and explanation of actual examples in Japan's experience seemed to me to be a good way of accomplishing that.

3.7.2 Theme of Speech: Why Improvement Is Needed (see A-3)

(1) Since the Polish word for the Japanese "kaizen" (improvement) has a narrow sense and there is no other appropriate equivalent for "kaizen", we have used the word "kaizen" here in order to convey the broad sense of the Japanese word.

(2) Explanation by the example of rationalization activities at Isuzu Motors

By the example of vigorous improvement activities also including all companies cooperating with Isuzu, I explained mainly the way in which the work was done for achievement of results with respect to different QCD themes.

That method can be effectively used in the company's interdepartmental activities.

It is necessary to understand that reduction of personnel on the line is useful from the viewpoint of creating a system in which some such former line workers are put in improvement teams for further acceleration of improvement as improvement specialist and effective use is made of others in areas such as design, services and sales, where there are not enough people besides making it possible to implement future production increases without increasing company personnel strength.

(3) In giving examples of urgent improvement proposals made with respect to the company, my explanations were conducive to understanding of the fact that there were several possible solution for each proposal and included citation of examples of how the people in charge in the company are fully capable of making the necessary improvements and indeed have made good use of the proposals.

Furthermore, the Company's personnel deserve praise for the fact that they have considerable ability in that respect and are making good use of it.

- (4) I explained that ensuring of QCD is a major premise for the company's development.
- (5) Going to another subject, I explained how Isuzu Motors has gone about promotion of policymanagement and did my best to have them understand that policies must be accompanied not only by tasks but also target figures and measures.
Furthermore, it is extremely important to accomplish good breakdown of target figures for lower echelons of company organization.
- (6) To sum up, it is necessary to be aware of the fact that "profit equals selling price minus cost" and the great importance of company efforts to lower cost in order to make a bigger profit and at the same time benefit the client, who should always come first.

The photographs and other materials used in the talk will be presented in connection with the urgent proposal items.

3.8 Report on Activities of Assembly Improvement Team

As indicated in the inception report, the basic policy of the study by the person in charge of production technology and production management has been determination of the actual situation at the plant, digging into problems and presenting urgent improvement proposals starting with things that can be immediately improved and having the members of the company's improvement teams implement the improvements and providing them with guidance for that purpose so that they can learn improvement methods and QC techniques and share in the joy of accomplishment of improvements. (see Fig. 3-2-4)

Since specific operating methods and reform of awareness and taking root are explained in 8.1, a summary explanation will be given here of the content of the improvements promoted by the engine improvement team as announced at the production improvement seminar held on December 2-3.

Although it was not possible to progress all the way to definitive solutions because of the limited amount of time, we very much impressed that they all able to enthusiastically participate in the discussions and work together across organizational barriers. They were also able to share the joy of improvement through the reports presented at the seminar, and the gratitude that they expressed can be considered a good index of the substantial effect achieved.

The full texts of the reports presented are given in A-4.

The leader of the assembly improvement team, the entire composition of which will be indicated later, is a foreman of the assembly department. As the person with overall responsibility on the line, he worked very well with the other three members, selected from office departments, and accomplished his leadership duties in an outstanding manner even by Japanese standards, for which he deserves our full admiration.

In their day-to-day work they collected data and held frequent meetings to analyze it. Whenever I called the team together, they readily responded, which is an indication of appropriate instructions received from the company's top management.

When I could not find the time to immediately respond to requests by the company president and others to see them, they were good enough to say that afterwards, when I had the time, would be fine, which for me was an indication of enthusiasm on their part.

The following is an outline of how the improvement team carried out its activities.

(1) Setting of Task/Problem

- Reasons for taking them up

The problem "many parts supply shortage" was taken up because as a result of discussion by all of the team members it was determined that the high frequency of defects was a common worry for everyone.

- Setting of goal figures

50% reduction of parts supply shortage

It was intended to use the data of April, June and September, 1996, for analysis, but since it was inadequate, the data for the period September 25 to November 20, 1996, was used instead.

(2) Team Composition

Team leader : Z. Kolodziej, S680 (assembly section)

Members: : M. Rasinska, PKK (planning section)

: S. Furman, PT (production technology)

: M. Kudyba, PKZ (procurement management)

(3) Determination of Present Situation

- a) A large sheet was posted at a place where the assembly process can be clearly seen for keeping a daily record of information on defects.

That is a typical example of "control by seeing" and can be considered to have been successful as one way of vitalizing the line (see Fig. 3-8-1).

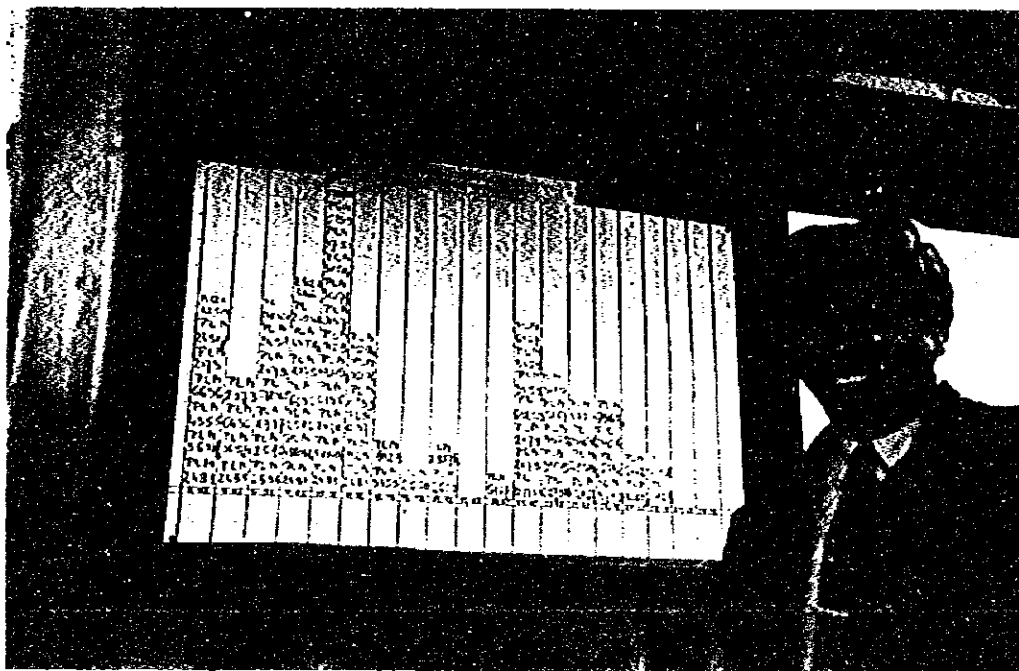


Fig. 3-8-1 Daily Record of Parts Shortage

(4) Analysis and Verification (Factor Analysis)

- a) When I asked them to draw Pareto charts and diagrams for analysis of the collected data, at first they were all rather perplexed, but they gradually came to understand what it was all about.

Although there were a few mistakes in the reports that were presented, I still think it was good experience for them.

- b) On the other hand, although I tried to get them to understand the "characteristic factor diagram" (better known as the "fishbone diagram"), which is for the purpose of identifying the real causes, instead of proceeding in the direction of narrowing down the possibilities, they kept going wider and wider, and I had to give up the idea because of the limited amount of time available. Since I have had the same experience in Japan, it can be concluded that that endeavor on my part was a little too ambitious.
- c) In tracking down the causes, at first the tendency was to put the blame on others, but in the end I got them to realize the importance of objectively assessing one's own responsibility as well. At first they were reluctant to put the finger on themselves, fearing the repercussions of being held responsible, but I made every effort to get across the idea that it was not a matter of putting the blame on any individual or organizational unit but rather that the aim was merely that of finding the real causes so as to be able to remedy the situation.
- d) As a result they are now learning to look at themselves objectively, too, in looking for the causes, having recognized things such as the fact that production plans are not presented early enough, the fact that the figures of the 3-month plans are too rough and the fact that the inordinately frequent changes in the plans can be ascribed to a large extent to insufficient maintenance.
Since they are now considering the problem of lack of funds on the part of the problematic company MELEX and the problem of poor quality of materials from the viewpoint of their own responsibility as well, they are now able to see the direction to proceed in toward remedying such problems.
- (5) As can be seen from the above, the measures that have to be taken are beginning to be more clearly defined, but for lack of time they have not yet been able to decide on definitive measures, the stage that has been reached being that of having decided to coordinate and study the problems with related departments and sections.
It remains to be seen whether or not there will be appropriate follow-up.