The Operating Characteristics of Quality Circles and Yield Improvement Teams: A Case Study Comparison

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This paper reports on research, carried out in a Scottish-based printed circuit board manufacturer, which compared and contrasted the Company's experiences of quality circles with that of yield improvement teams. Amongst the main findings are that a quality circle will only manage to keep solving problems if the members function as an effective team; the correct choice of circle project and the leadership of the circle are essential features in developing the teamwork. The primary aim of a yield improvement team is to solve problems with the team developing around its achievements, the members tend to work more on an individual basis than those of a quality circle. Whilst quality circles did manage to complete a number of projects, their major contribution was in the involvement and development of people. The yield improvement teams solved problems around four times faster than a quality circle and contributed to resolving a number of major quality concerns which existed in the Company. It is also pointed out that management may introduce a circle programme to involve and develop its shopfloor employees but if, after a period of time, circles are not seen as making a contribution in terms of solving the problems facing the business, then no matter how good the intention at the outset, criticisms from most levels of the organisation will start to be directed at circles.

Introduction

Since quality circles were discovered by Western organisations there has been no shortage of words written about their use in manufacturing and service companies, the contributions coming from academics, consultants and practitioners. It is clear from a cursory study of the literature that quality circles are viewed from a variety of angles. For example, to improve industrial relations, improve communications, improve quality awareness, improve productivity, solve quality problems, solve problems in general, develop people, foster teamwork, and increase employee involvement and participation.

When quality circles have been operated by an organisation for a period of time and after the honeymoon phase is over, there is little doubt that some evaluation in terms of their contribution to the organisation will be made. According to Sherwood *et al*,[12] it is unlikely that a planned, systematic evaluation of quality circles will take place against the organisation's objectives for launching a quality circle programme. They will, however, be evaluated informally in terms of their effectiveness, by people from all levels of the organisation, including the circle members themselves.

The last five years or so have seen an increased level of commitment by UK manufacturing industry to the

concept of total quality management. A key element in the process of total quality management is teamwork as a work practice and the involvement of people in different forms of group activity to address quality concerns and facilitate quality and process improvement. It is our view that those organisations which have a quality circle programme in operation, when they start to develop the process of total quality management, will compare and contrast the effectiveness of quality circles and their contribution to the business with other types of quality improvement group activity. If the differences in operating characteristics and contributions are not made clear to all organisational levels, it is likely that quality circles will be superseded by other types of group activity. Writers such as Lawler and Mohrman,[8] Mroczkowski,[11] Walton[15] and Dale and Lees[2] have expressed their views on situations such as this and speculate on how quality circles might develop into something else.

Research has been carried out by the authors which compared and contrasted a printed circuit board manufacturer's experience of quality circles with that of yield improvement teams. This paper reports the main findings. It opens by discussing the main reasons for the demise of the quality circle programme; this is followed by presenting an outline of the operating characteristics of quality circles. A description is then given of the yield improvement programme (YIP) and the yield improvement teams (YITs). The paper concludes by examining the essential differences of quality circles and yield improvement teams along with the benefits gained by the Company from their use.

Background to the Study

The Company is one of Europe's largest manufacturers of printed circuit boards. It has grown, in less than 20 years, from two people to employing around 480 people in two sites in Scotland and now has a turnover in excess of £24 million. One plant (Plant A) deals mainly with multi-layer printed circuit boards (PCBs), and the other plant (Plant B) produces double-sided plated through hole PCBs.

The research methodology usually employed in a study of quality circles is for the researcher to visit, on a number of occasions, the company or companies being studied in order to conduct an interview programme; the interviews are often supported by some form of questionnaire survey. Some researchers prefer to just carry out a questionnaire survey. In the case of the research described in this paper, the Company funded the post of Research Assistant and the person appointed to the position worked full-time in the Company and acted as the informal facilitator to the

quality circle programme and carried out various duties associated with the YIP. In this capacity, the researcher was able to observe a total pattern of activity as related to quality circles and the YIP; they were accepted as a Company employee and in that capacity were able to have free and frank discussion with people from all organisational levels, and to obtain several first-hand insights into how various events can influence quality circles and the YITs. They also got familiar with the company's processes and products, organisational culture and people, which is important in categorising and analysing information collected for research purposes. When a researcher just visits a company on an intermittent basis for the purpose of holding interviews, they see only part of the picture and tend to miss some of the important detail; in addition the person being interviewed is likely to tell the researcher what they want to hear, rather than express their true feelings.

The Demise of the Quality Circle Programme

A quality circle programme operated in the Company for four years or so with one circle surviving for three years; details of the programme are given by McHugh and Dale in Wild.[17] During its life the programme had many ups and downs. The problems experienced when it had been in operation for some eighteen months (this is the time at which most commentators are agreed that the programme is likely to run into difficulties), are described by Dale and Lees.[3] In a period of around one year, the Company went from having 12 circles in operation to a situation in which they had none. Many of these circles were relatively new and had the initial enthusiasm which often occurs at inception. However, the factors which contributed to the eventual demise of the programme were already in place within the individual circles. When this particular piece of research commenced, seven circles still existed in Plant A, but only two were operating with any kind of success.

When a redundancy programme was declared by the Company in May 1987 followed by considerable organisational restructuring, all circle activity in Plant B ceased. However, the circles in Plant A encountered all the problems of the circles in their sister plant but managed to carry on with their activities for a further eight months. The main reasons for the circle activity surviving for a longer period in Plant A include the following: circle members who disciplined themselves to meet on a regular basis; a decision to tackle simple projects that could be implemented without too much trouble; and members who were very conscious of quality. The multi-layer product environment helped maintain their enthusiasm.

The two circles which survived for the longest time found it increasingly difficult to get their project solutions implemented. The reorganisation had left the Company with little spare resources in areas such as engineering and maintenance which are those typically involved in circle project implementation. Due to the situation in which the Company found itself, these departments had other pressing priorities. The facilitator found that no amount of encouragement could prevent members becoming despondent, due to the lack of progress on project implementation. In view of this, circle members decided to discontinue the circle activity. A summary of the main reasons which contributed to the termination of circle activity in the Company is now presented.

Redundancy and Reorganisation

The Company's market situation had steadily declined since 1984 and in early 1987 they, like many other organisations in the PCB industry, had a lack of orders. In May 1987, for the first time in its 18 years of operation, the Company had to declare a number of redundancies, which shocked many employees. It made considerable organisational changes and Plant B increased the volume of its operations. This involved redeployment of personnel from Plant A with changes in jobs and responsibilities and the transfer of personnel between shifts.

It was the redundancy programme followed by reorganisation which was the main reason for circles stopping meeting. The redeployment of personnel gave particular problems; each week a transfer of personnel was made between the plants. This, in conjunction with members being spread across three different shifts, made it difficult for circles to maintain any form of consistency and make any headway with their projects.

In the period immediately proceeding and following the declaration of redundancies there was a severe problem with employee morale, mainly due to fear of Company closure. The situation began to improve as the order book started to fill up; however, the damage done to circles during this period was irrevocable.

The way in which one of the last two surviving circles in Plant A ceased to function is a good example of how uncertainty can affect circles. A certain amount of insecurity was brought about as there was some speculation that the department in which the circle operated would be transferred to the other plant; management could not give them any reassurances that this would not happen. The circle members decided that there would be little point in the circle taking on further projects.

Lack of Management Support

This was a grey area with many interpretations existing among circle members and management alike. There was a strong feeling amongst current and former circle members interviewed that, whilst the majority of management gave verbal support to circles, in reality this often failed to feed through to the circles in the form of actual support. For example, some production managers did not look favourably on the time spent by operators on circle activities and on a few occasions circle meetings were not allowed to take place due to outstanding production commitments. The findings indicate that it was the unfavourable attitude displayed by production management, as perceived by circle members, to the production time lost due to circle activities, which was the greatest concern to those involved in circles. There was also a lack of positive feedback to circles about their projects; this surfaced in the form of little interest being shown by management in how projects progressed from the management presentation stage to implementation, lack of explanation as to why circle suggestions for project resolution had been rejected, and not showing interest in how current circle projects were progressing.

At the commencement of the programme there was undoubtedly considerable interest, support and encouragement by management to circle activities, but as the novelty aspect wore off, so did management support. The general view was that management had given up on circles and they did not really care whether they succeeded or failed and that some management had not really been interested in circles in the first place – they were just a "flavour-of-the-month". However, considerable time was spent in the circle programme steering committee in examining the way in which circles should develop and the resources required for this in terms of leader training in teamwork skills, etc. If these deliberations had been communicated better, it might have counteracted the perceptions of a lack of support for quality circles.

The main criticism which management expressed about quality circles was their lack of power to solve problems. The circles included operators from one department only and they were not encouraged to tackle projects outside their own area of work. The manufacture of printed circuit boards is carried out through a variety of interconnected processes, and the single discipline quality circle concept was not ideally suited to solving problems relating to the manufacturing process.

Poor Choice of Circle Project

Many of the projects chosen by the circles were too complex and this usually resulted in failure to resolve

them successfully, even after some considerable time and effort had been spent on the task. In addition, the circles had a tendency to choose as a project theme those problems which were already being looked at by other people within the Company, and when this was discovered, the circle shelved the project, leading to a feeling of frustration amongst the circle membership. It was also a consensus view of management that circles only tackled trivial problems and this fed through to circles' members.

These factors contributed to circle members feeling there was little point in continuing with the circle activity, since they did not have the right skills to undertake and resolve major problems in their respective departments, and management did not seem to appreciate the projects they did manage to solve. The circle leaders made valiant efforts to keep up the team spirit, but as projects began to be encompassed by the YITs the circles felt they were being left with no projects worth tackling or evoked their enthusiasm.

During the period leading up to the redundancy and for some time afterwards, there was an emphasis within the Company on cost-cutting. The circles found it difficult to identify projects which could save money and produce a quick return; projects which showed a low internal rate of return were dropped as it was realised that the project recommendations would not be accepted. This tended to create a negative attitude and a low morale amongst the circle membership. This was typical of the way in which one of the remaining circles in Plant A ceased to exist.

Quality Circle Operating Characteristics

At the outset, the Company's quality circles had many of the traditional operating characteristics as described by writers such as Hutchins,[6] Ishikawa[7] and Mohr and Mohr.[10] All the circles followed the principles set down by the Company for quality circle operation, for example:

- Circle members would appear on time with note-books and ideas, and be clear on the objectives of the meeting. The leader would have arrived some minutes earlier to arrange and display circle-related information around the meeting room.

- The circle would go straight to the point where they had left off from the previous meeting and commence discussing issues concerned with the current project(s).

- All tasks which had been allocated since the last meeting would have been carried out and when

progress was reviewed, members would give concise answers.

- Any problems encountered during the course of project resolution would be faced and tackled using the seven traditional quality circle techniques (Ishikawa[9]), no tasks would be shirked.

- Towards the end of a circle meeting a list of issues which needed further investigation would be drawn-up, and members would volunteer to undertake specific tasks.

When the circle activity began to wane, a number of these operating characteristics began to change, for example:

- Circle members would appear at various intervals during the course of the meeting. They would take some time to settle down and bring themselves up-to-date with the project(s) under consideration.

- There would be a tendency to talk about problems which had occurred in their work area since the last meeting, consequently the meeting would be sidetracked from discussing key issues relating to the project(s) being tackled.

- Discussion about the current project(s) would only take place toward the end of the meeting. The circle members would tend to hurry through the points being discussed and look for the easier task to volunteer to undertake for the next meeting, the more difficult aspects of the project would be put on one side.

- Circle members became increasingly reluctant to use the seven quality circle techniques which they had mastered and used successfully in previous projects; the only technique they continued to use was that of brainstorming. The reason given by members for this failure to use the techniques was knowledge of the problems and their cause without having to use the techniques and follow the circle disciplines, which it was felt wasted them time.

The difference in these operating characteristics is obvious and relates to the reasons given earlier for the demise of the circle programme. It is suggested that organisations who wish to maintain a programme of quality circles should monitor the behaviour of people in circle meetings and the characteristics of such meetings; any changes in behaviour and characteristics along the lines indicated above is an indication that the health of a circle is in decline.

Circle momentum is difficult to maintain when events in a company have caused morale to become low and circle activity and its membership have been disrupted.

When this is the case, members of the senior management team need to increase the level of their visible support to the circles. In the Company this did not occur, senior management were heavily committed to ensuring that the Company survived as a manufacturing entity and as a consequence the circle programme got neglected.

The Yield Improvement Programme

The Company introduced statistical process control (SPC) in the autumn of 1985; the implementation and development of SPC is described by Manson and Dale.[9]

Whilst SPC had contributed to getting a number of processes into a state of statistical control, and with the reduction of scrap, it was recognised that some of the Company's quality concerns were not capable of being solved by SPC on its own. At that time, the scrap rate was in double figures. In September 1987, the Company introduced a Yield Improvement Programme and this provided a new impetus to the use of SPC. In particular, it improved its credibility amongst manufacturing personnel as an effective tool for reducing variation, improving process yields, and reducing scrap.

The YIP has a steering committee comprising the quality engineering director, quality engineering manager and SPC managers. A computerised system of task management is used as part of the programme, on which all problems and projects are recorded. There are currently 17 YITs in the programme, each of which is responsible for improving the yield performance of the processes in their department and reducing scrap. Each YIT is comprised of a diagonal slice of personnel from the area — supervisor, section leader, engineer, SPC co-ordinator, maintenance personnel, and sometimes operators. The team is led by a production manager or a senior engineer and meets on a weekly basis.

Daily and weekly scrap reports are produced for each YIT; these reports provide information such as number of images and panels scrapped, the value of the scrapped product, source and reasons for the scrap. Each week a graph showing the value of scrap for the top four categories of product non-conformance is provided to each team. In addition, they are given a yeild improvement graph which shows the process yields on a week-to-week basis along with a monthly moving average. This data is displayed in the area in which the YIT operates and on the company noticeboard displaying the performance of the YITs.

The YIP and its YITs are driven by a task management system. The leader of the YIT sets a target on a three-monthly planning horizon for reducing scrap and improving the yield. Each team breaks the scrap down into its various sources and then a series of tasks are identified to improve the situation. Specific responsibilities are allocated to team members along with a target date for project resolution. If the task is not completed by the set target date, the owner of the task is required to report to the team the reason for this and, after discussions involving all team members, must reset the date for task completion. In turn, the leaders of each team report weekly to the steering committee to account for the previous week's product non-conformances and say what corrective action and countermeasures had been taken and what is being done to improve the yield. The steering committee examine any trends within the programme and give advice to leaders who are experiencing difficulties in completing their tasks. The steering committee are also responsible for evaluating the effectiveness of the YIP and report each month to the managing director on the progress made.

A typical format of a YIT meeting will be for the leader to open the meeting by reviewing the various reports and outstanding tasks. The people with tasks are required to explain the progress they have made and other members are encouraged to offer constructive criticism; this often takes place through a brainstorming exercise supported by cause and effect analysis. Other tasks are then allocated amongst team members as necessary. The main characteristics of a YIT meeting is that problems are discussed in a rapid manner and members are encouraged to keep their contributions concise. If there is a problem that is taking some considerable time to resolve, then a separate task force will be formed to tackle it.

Quality Circles and Quality Improvement Teams: The Essential Differences

Quality circles have a dual function. They are a means of involving employees, in particular, operators in problem solving, and a way of increasing employee participation; this leads to the building of teams and development of people. The extent to which this happens is very much dependent on the people involved. In circles, the emphasis is on the leader to coach and encourage members, and ensure that they follow the circle discipline and use the recognised circle techniques. If the circle is led in an effective manner, a strong team can be formed and the circle will successfully complete projects.

The YITs were established in order to improve process

yields, reduce scrap and solve quality-related problems. Unlike quality circles, which will only manage to solve problems if an effective team has been developed, a YIT is formed around a particular problem. Every member of the team is given their own particular part of a problem to solve in the form of a task, other people are brought into the team to assist with aspects of the problem which are alien to the teams resources. These people may only stay for the solution of the current project, or they may be asked to become a permanent member of the team. The team and the team members always have goals and targets to meet, the team tends to develop around its achievements in solving problems and improving process yields. If the YIT reaches a stage where it is not making any headway with their current project, they seek advice from the steering committee and bring someone into the team with the expertise to assist in its solution, whereas a circle encountering this kind of obstacle would be more reluctant to seek outside help and would tend to drop the problem.

Considerable development of people did occur with circles, many employees gained presentation skills, improved their problem solving skills and some progressed into more senior positions within the Company. In a quality circle, the members tend to work together as a team. By comparison, the YIT members, whilst they work as a team, have responsibilities for specific tasks in solving a problem. In the YIT considerable onus is on the individual. In this way they learn the skill of setting targets, time management and completing tasks by a target date. The team building that takes place is different from that of circles. Each member of the YIT realises that if they do not manage to complete the task allocated to them, the whole team will suffer. More is expected of individual members and there is considerable peer pressure to perform.

The YITs are now working on more of the Company's deep-rooted problems and the team building may disappear as the frequency between meetings increases, as is typically the case when a group tackles more complex problems.

The leader of a quality circle is likely to be a section leader or supervisor with the membership of the circles drawn from the ranks of operators. At that time, the section leaders had little real authority and managerial power, and they did not have easy access to the areas and people from whom information and help was needed. The YIT is led by a production manager and comprises of people more senior than operators. Thus, it is clear that the problem-solving potential of the YIT is much greater than that of the quality circle.

Quality circles solve problems at very different rates, varying from 4 to 5 projects a year to just one or two.

The YITs solve problems in a relatively rapid manner, ranging from one week to one month. It is estimated that a YIT will solve a typical circle project around four times quicker than a quality circle would do.

The YITs have been effective in solving some of the major quality concerns which have existed in the Company for some time. The quality circles never made any inroads into the Company's major quality problems, because of the skill limitations of their members. The theory behind quality circles, in relation to problem solving, is they tap the resources of shop-floor employees and provide the mechanism by which they can solve the problems they know exist and have to work around and which nobody seems to care about. These problems tend to be the day-to-day irritants and occasionally they will stumble onto a problem which when solved will provide a substantial payback. It was never the intention of the Company that they would tackle and resolve major quality problems. It is clear, however, that some of the Company's managers did view circles as a problem solving resource and not as an exercise in people and team building, and it was these managers who inevitably started to question the contribution of circles to the business.

The Yield Improvement Programme is supported by a well-structured steering committee which reported each month to the Managing Director on the progress being made. The weekly reporting by the team leaders of the YITs ensures that the right problems are being tackled and progress is made with the projects which are currently in-hand. The importance of the YIP was always emphasised to each team leader in the reporting meetings; it was stressed to the leaders that the problems registered on the task management system were their first priority. On the other hand, with circles the attitude latterly tended to be "fit in a circle meeting and carry out your activities when you have some time"; their activities were given little priority. The quality circle programme did have a steering committee which took decisions on training, organising circle evenings, expenditure, etc., but there was little regular reporting of the progress of individual circles. There was also some difference of opinion amongst the steering committee members as to the purpose of circles, how they should operate and their ability to solve problems.

Quality Circles and Quality Improvement Teams: What are the Benefits?

The quality circles solved around 50 projects during the four or so years they were in operation; McHugh and Dale in Wild[17] quote the following achievements:

"Improved safety —

- A new vacuum system in the drilling department. This extracted the fine dust generated when drills were re-ground, which had often caused headaches and eye irritation.
- Safer transportation of chemicals by laboratory personnel.

Better communication —

- A large display board in reception showing the manufacture of printed circuit boards, for the benefit of customers and visitors.

Financial savings —

- Special ovens in the screening department were refurbished. This led to 30% greater efficiency and a reduction in scrap to the value of £7000 a year.
- A new maintenance duty rota for a plating line was drawn up, which meant that it could be started up eight hours earlier than previously possible."

It was found that many of the people who volunteered for circles, some of whom became quality circle leaders, were of a high calibre and extremely capable. The Company had not recognised the potential of these people until their abilities began to surface through circle activities and the presentations they carried out. Subsequently, many of them were promoted to positions involving greater responsibility, for example section leaders, supervisors and engineers. The circles did promote team and people building and exposed people from all levels of the organisation to a variety of problem solving techniques. Whilst the YITs has been more successful in resolving problems than circles could ever be, there is little doubt that the team and people building and training received through the quality circle programme has contributed to the success of the YIP.

The benefits achieved from the YIP include:

- Long-established problems solved and processes have been brought under tighter control.
- Production personnel are more involved in improving the quality of the output from their processes.
- Scrap reduced by more than half.
- Process yield have improved by around 10%.
- Manufacturing lead time reduced by around 40%.
- On-time delivery improved by around 80%.

Discussion and Concluding Remarks

Quality circles appear to be a permanent feature of Japanese manufacturing industry as an element in the process of total quality management; see Wickens.[16] Quality circles were first launched in the UK in February 1978 at Rolls Royce in Derby, and based on research work carried out at UMIST it is believed that some 500 to 700 sites in manufacturing and service industries have had a circle programme at one time or another; undoubtedly there are a number of companies where the quality circle programme has not survived; see Frazer and Dale.[13] A number of writers have speculated on what the future might hold for quality circles in the UK. The issues include: did UK industry start quality circles before companies fully understood what was involved in total quality management? Did this contribute to the lack of circle success in some companies? Will these companies return to circles once they have developed a process of quality improvement? Do some organisations see quality circles mainly as a problem solving technique with people involvement and development and team building as a secondary benefit, rather than the other way around? Are quality circles seen as the latest fad? Are UK quality circles likely to be a permanent aspect of organisational life or have they got a life cycle? Have quality circles the tendency to develop into something else? Should such developments be encouraged or restricted? If Nissan Motor Manufacturing (UK) Ltd view circles as an essential plank (Jones in Dale and Plunkett[4]) in their approach to total quality management, should our manufacturing companies not be making efforts to ensure that they have a successful quality circle programme? The experience of the Company provides the opportunity to examine some of these issues.

Why did quality circles fail to become a permanent feature in the host Company?; was the concept wrong for the Company?; was it related to the way the Company interpreted the theory of quality circles?; or did the Company not follow the fundamental principles of quality circles? The Company, which is non-unionised, had a paternalistic style of management. It provides private health insurance for every employee, runs a profit-sharing scheme, and most employees own shares in the Company. Employee involvement is encouraged through regular departmental meetings. The Company environment in terms of its culture, was then ideal for the introduction of a quality circle programme. There was a circle steering committee, circle facilitators and circle members were provided with training. In terms of support structure and following the well-established guidelines for circle programme implementation the Company did most things right, with the exception that visible support from some managers could have been greater. However, circles were introduced and reached their peak, in terms of numbers, before the Company had fully developed their objectives and strategies for never-ending quality improvement, and it was this, rather than anything else, which contributed to the termina-

tion of activities. In short, the Company discovered quality circles too early.

The circle steering committee should be made up of a vertical cross-section of people within a company. This ensures that all points of view can be discussed, with the circle facilitator acting in an unbiased manner in resolving differences of opinion. The steering committee members should act as foster parents to the circles, in this way ensuring that they are familiar with the state-of-the-art of circles. The circle members formed the view that circles were of no great concern to the Company. The steering committee members were not all to blame, many of them were not aware of the level of support they should give to circles and there appears to be little guidance in the literature on this matter.

When the steering committee rejects a solution to a project which has been proposed by a quality circle, then the reasons for this must be clearly communicated to the circle members allowing them, if possible, to correct the shortcomings. The steering committee believed that they did give a full explanation for any project rejections, however; circle members felt that the explanation did not suffice for all the time and effort they had expended into trying to solve the project.

Most writers (e.g. Collard and Dale in Sisson,[15] Cox,[1] Spencer[14]), on the subject of quality circles, are agreed that the circle facilitator is vital to their success. The Company initially had two part-time facilitators, one for each plant; they held the position of production manager. Whilst the two roles should be complementary, the pressures of meeting the production schedule often caused these managers to have a conflict of loyalty. During this period the Personnel Manager took up a role as substitute facilitator. The Company did appoint a full-time facilitator, in the form of a university research assistant (see McHugh and Dale in Wild[17]), for a period of one year. During this time, the circles reached their peak of 12. The fact that the position was for just one year before the person took up a permanent job with the Company, was interpreted by some circle members that the Company did not view circles as a permanent feature of organisational life.

A number of circles came to a halt for project-related reasons. This included them not making any headway with their current project; the project they were tackling was found to be already under consideration by some other group within the Company; comments by management and their peers that circles only tackled trivial problems; and a belief that they could not find a worthwhile project in their area where they had the skills and resources to successfully resolve. Finally, whilst some 50 projects were solved, consider-

able frustration built up within the ranks of circle members on the time it took to reach a solution and get it implemented.

Clearly, many of the projects which circles chose as themes were beyond their capabilities to reach a satisfactory solution. How to stop circles falling into this trap is not easy. If the circle facilitator interferes and attempts to veto such projects, it will tend to restrict the freedom of the circle. On the other hand, if the facilitator allows a circle to carry on with a complex project, a lot of time and effort is wasted which can lead to frustration and a feeling of failure. The facilitator needs to exercise persuasion and tact in influencing the circle to choose projects which are worthwhile and can be solved; this is particularly important during the early life of a circle.

There is only one YIT which has operators as permanent members of the team. From time to time, operators are co-opted onto a team and become part of a task force established by a YIT to solve a particular task. Consequently, many of the skills learnt by operators through quality circles are not being exploited in the YIP. The operators who take part in the YIT activity feel that they are only there to be told what is going on rather than making a genuine contribution as they did in quality circles.

Teamwork is an essential feature in the process of quality improvement. The adoption of teamwork in day-to-day work practices is a relatively new phenomenon for a number of Western manufacturing organisations. There are a variety of ways in which an organisation might involve its people in teamwork. The teams should be structured to suit a company's culture, products, processes and people, and each company will have to find the best means of fostering this kind of activity.

The experience of the Company provides two different examples of team building — quality circles and quality improvement teams. The prime aim of quality circles is to develop and involve people (who are mainly from the ranks of operators) and foster teamwork at this level. This comes about through solving problems which are irritants in their day-to-day work activity. If they are not successful at resolving problems, then the team-building and development can be restricted. Also, if management does not respect the team-building side of quality circles and constantly questions the contribution which circles are making to the business, expressing doubts about the projects being undertaken by circles and their success in resolving problems, then this will have a detrimental effect on the life of the circle. A number of the benefits of circles are hard to quantify, such as increased employee involvement, quality awareness and commitment,

more awareness of company problems and better safety practices. The prime task of a YIT is to solve quality-related problems; any team-building and personal development is of secondary consideration. The circle members felt they had little support in the Company for their problem-solving efforts. The Company learnt a valuable lesson from this which was used in the setting-up of the YITs, in which each team always has an ultimate goal and each individual within the team always has targets. The YITs have been successful in reducing scrap levels and improving process yield and this has assisted in the building of strong teams.

Acknowledgements

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