

6

Panel Discussion Part-2

"How will Material Flow Cost Accounting Contribute to Better Eco-Efficiency?"

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Coordinator:

Katsuhiko Kokubu Project Leader, IGES Kansai Research Center
Professor, Graduate School of Business Administration, Kobe University

Panelists:

Michiyasu Nakajima Associate Professor, Faculty of Commerce, Kansai University
Bernd Wagner Professor, University of Augsburg, Germany
Robert B. Pojasek Adjunct Professor, Harvard University/ President, Pojasek & Associates
Jun Okajima Manager, Finance & Accounting Department, Nippon Paint Co.,Ltd.
Yoshitsugu Kokuryo General Manager, Environmental Management Unit, Shionogi & Co.,Ltd.

Kokubu

Now let us begin the panel discussion, the last part of the symposium. We have had a number of fruitful presentations since this morning and this panel discussion will be the conclusion for the day. With distinguished speakers from session 2 and speakers of the two case studies of MFCA invited as panelists, we shall begin the discussion.

During the break, we collected the questionnaires. We are glad to have received many more questions than we expected. Since we are not able to address them all, I will choose several for the panel discussion. If your question was not answered during the panel discussion, please remember that Dr. Pojasek and other panelists are willing to respond to your questions by e-mail.

As reported earlier, speakers from two companies made presentation respectively about their attempts to implement MFCA at their plant. I would like to invite Prof. Wagner from Germany and Dr. Pojasek from the USA to speak shortly about the impressions from these presentations.

Prof. Wagner, would you speak first?

Wagner

I have been to both companies and I expected to come to Japan having lot of experience in this area and show people what and how to do it and how to improve on their method. I found out I can learn just as much as they can learn from my knowledge. These were pioneer experiences in the two companies I

visited. They were not on a too big scale, so it's not too complex to introduce the method and learn from it. We use some common instruments like we all do the material flow chart and we use the same metrics including material costs, system costs, and disposal costs. But all the projects produce new developments and new ideas which improve the method, which we are very interested to share, and where we can maybe have in future joint projects to develop this method on an international basis.

Kokubu

Thank you. Dr. Pojasek, would you please speak next?

Pojasek

I had an opportunity to learn about these case studies for the first time in a pre-conference workshop. I was very impressed with the excellent work.

From the materials presented, there seemed to be a focus on the main process in each case. In many cases, the supporting processes can have more wastes and costs associated with them than the main process. In the case of Nippon Paint, there would be the costs of cleaning the tanks and pipes. What are the reformulation costs associated with a bad batch of paint? What are the costs to treat the wastewater, the disposal of the paint filters, the maintenance of the equipment, the laundry of the workers' uniforms, and the clean-up associated with the "pigging" operations? These supporting processes also use energy, water, and

materials. When you are cleaning the tanks, the company cannot be making another batch of paint. This also represents an indirect cost to the operation. There are many supporting operations in a batch process like this one. I realize that they captured many of these costs. The Resource Accounting Sheets and the Activity Accounting Sheets in the Systems Approach helps to keep track of these supporting processes and makes certain that their costs are properly allocated to the specific work step(s) that are responsible for these costs. By looking at the whole "system" from both a resource and indirect activity perspective, there may be many additional opportunities to improve the process. I really enjoyed Nippon Paint's last slides where they stated that they are striving for ZERO EMISSIONS. That is a wonderful proclamation and goal. I hope many other companies follow their excellent example!

Shionogi & Company can also benefit from the use of the Systems Approach. Their process information can be readily converted into a hierarchical process map. Using the Resource Accounting Sheets and the Activity Accounting Sheets, it is possible to link all the supporting process to the work steps in the main process that are responsible for them. In this way, the systems costs can be evaluated with much more accuracy. Quality control (laboratory waste costs) and recycling are examples of supporting processes in their operations. There are many activity costs associated with obtaining and maintaining permits from the government.

Shionogi has made an excellent start to look at the transportation costs associated with the interface with their suppliers. Their suppliers could use the Systems Approach to lower their own costs and look for opportunities to better service Shionogi & Company. Shionogi & Company could also use the Systems Approach to better service their customers. Could they deliver the pharmaceuticals to the customer in smaller blister packs or some other form? The answer to this question would change many things back at the factory. The Systems Approach helps a company ask these questions and look for a wider variety of opportunities to improve.

It is important to consider that management does not like us to be changing any of the main processes.

They may think that these are working just fine. However, they do not have the same opinion of the supporting processes. Usually it is easy to make changes in these processes. This kaizen in supporting processes helps to save money and build trust in the Systems Approach. After a couple of years, the focus of the program can shift to the main process while further improvements are being made in the supporting processes. In the case companies, the management has been enlightened by letting them address issues in the main process. These cases were excellent. I am very impressed with their work.

Kokubu

Thank you. We have heard comments from Prof. Wagner on the two companies' efforts to implement MFCA from a German point of view, praising them as excellent pioneering activities. Dr. Pojasek gave valuable comments from a systems approach standpoint, inviting us to be aware of the possibility of making new discoveries as we divide a process into supporting processes.

Through various projects, we have been trying to introduce MFCA methodology developed in Germany into Japanese companies with the aim of improving their eco-efficiency and cost reduction. In the USA, Dr. Pojasek pursues the same goal but with a new different methodology of his own development. One of the great significance of this symposium is to discuss over the integration of these two different methodologies.

Mr. Okajima (Nippon Paint) and Mr. Kokuryo (Shionogi), would you like to respond to the comments from Prof. Wagner and Dr. Pojasek?

Okajima

I would like to thank Prof. Wagner for praising the new ideas of our projects. One particular achievement in our project is our realization about the importance of the power factor as a result of improving energy loss.

In relation to the comment from Dr. Pojasek, I would like to add some practical details about the cleaning cost. For the calculation of cleaning cost, we have chosen the example of a water base paint manufacturing process, in which some materials are

retrieved for reuse in later production of the same paint. The labor cost and labor hours associated with the cleaning process were taken account of in our material flow cost calculation.

As to the Dr. Pojasek's comments on our concept of zero emission, it has been set as our goal of environmental management.

Kokubu

Thank you. Mr. Kokuryo, would you please speak next?

Kokuryo

Concerning comment from Prof. Wagner, with regard to the calculation of material flow cost, I became more convinced that the price ratio of cost contribution out of chemical reaction is more efficient than that of conventional weight ratio. Dr. Pojasek mentioned various types of costs, some of which may not have been addressed in our calculation. It made us realized that we had not taken account of the sampling cost and the cost for maintaining the test facility, for example. In the future, we would include a wider range of data in our calculation, which will facilitate us identifying the targets for further improvement and cost reduction. Thank you.

Kokubu

Thank you. Mr. Okajima and Mr. Kokuryo have responded to the comments from Prof. Wagner and Dr. Pojasek. Now I wish to remind you of one important point in Dr. Pojasek comments.

Dr. Pojasek has pointed out that management is often reluctant to change the main processes but open to changes in the supporting processes. As I understand, Dr. Pojasek has emphasized the validity of process mapping in breaking down the supporting processes into details so that possible improvement can be identified. The improvement of such details may lead to the improvement of the main processes.

Based on my research on MFCA and my experience with Japanese companies, I am quite convinced that MFCA has potentiality of supplying valuable information with main processes not just with supporting systems.

Prof. Wagner, could you give us some comments on this?

Wagner

This is true. We see a slight difference between a normal or general process-oriented approach and the material flow approach. The slight difference is that we take as core process, the material flow, and this material flow can give the supporting processes and all the other processes a structure and a logic. You find a lot of companies that do a process mapping and process orientation. But there's not a real logic behind how to select processes and which are the main processes and which are supporting processes. We feel in our project that the material flow can give to this whole thinking, a systematical approach and the material flow can be the core of everything. And everything can be structured around this. So this, I think, is the connection.

Kokubu

Thank you. Prof. Nakajima, do you have any comments on this?

Nakajima

As I previously compared the role of MFCA with that of a mirror, we would like it to reflect the entire real production process as much as possible. The systems approach proposed by Dr. Pojasek, on the other hand, first identifies problematical areas and then maps out processes starting from these areas. It is rare to find major environmental problems in main production lines from the standpoint of environmental load. Environmental problems, such as those related to the sewage treatment, air pollution and noise nuisance happen more often on the periphery, at points often described as the "end of the pipe." Problems appear to originate not from the main production lines but from the periphery.

The concept of MFCA is to find out hidden problems in company processes from the viewpoint of material flow. This explains why its primary attention is paid to the mass balance. It can be concluded that there is a distinct difference in starting point between the systems approach and MFCA.

However, MFCA and the systems approach share the same approach of seeing the comprehensive picture as a result of breaking down the process into details. The difference lies in the strategy, procedure and in

the starting point. It will be very interesting to see how these differences may contribute to the difference between the two methodologies.

Kokubu

Thank you.

We have received many comments and questions from the audience. Now let's address some of them to further develop our discussions on the topic.

To start with, I wish to address a comment from Mr. Anjo from Canon. In his comment, he explains that Canon sees its environmental management activities as a way to maximize its eco-efficiency and pursues developing eco-efficient products through cost-efficient production processes using what they call a "cell production method". Though independently from IGES, Canon also has been working on the implementation of MFCA. Here we have a precious opportunity to hear about their experiences.

Anjo

We started our experimental study on MFCA in 2001 within the framework of an environmental accounting project sponsored by the Japan Environmental Management Association for Industry, a research project assigned by the Ministry of Economy, Trade, and Industry (METI).

As we implemented MFCA to a lens processing at our Utsunomiya Factory, we found that one third of the materials were wasted as material loss. In other words, we were producing large material loss that worth a half of the amount of lenses that we supplied to the market, which was a very shocking news for us. We finally realized our ignorance about such wastefulness after more than 60 years of experience in manufacturing lenses.

For a long time, we have repeated many trials and errors in our attempt to define the economical value of the waste. MFCA gave us a clear guideline in this respect with its principle to evaluate the outputs based on the purchasing cost of the inputs. For example, it was difficult to measure the resulting carbon dioxide until we based the evaluation on the cost of energy (electricity) that we purchased to produce it. Similarly, it was difficult to measure the material wastes in polishing lenses until we divided the gloss material

cost according to the weight of the wasted portion. Such methodologies are very understandable. We are now getting ready for company-wide implementation of such methodologies.

The second session of the today's symposium is titled "Environmental Management Accounting for Better Eco-Efficiency." This has been a surprising title because it coincided with the slogan of our environmental management, "maximization of our eco-efficiency".

In addition to lenses, Canon manufactures a wide range of products like toner, ink, copiers, and cameras. Different products may have different patterns of manufacturing processes. We wish to continue our efforts in reducing material loss and optimizing our eco-efficiency, thereby reducing the cost and saving energy.

Kokubu

Thank you for your valuable comments. If time permits, we shall come back to this topic for further discussion later on. Since we have received many questions about the earlier presentations, we now have to include some of them in our discussion.

We received some questions about MFCA, which was the subject of the presentations by Prof. Wagner and Prof. Nakajima. In addition, we have received almost similar number of questions about the process mapping method presented by Dr. Pojasek. Many of these questions include various topics for the discussion. Please allow me to choose some of the topics as we will not be able to cover them all in our discussion.

The questions we received fall generally into the following three categories: questions about the methodology of MFCA or process mapping; questions about a particular case; and questions about the application. Let us start with the questions about the methodology of MFCA.

Mr. Higashida from Kobe University raised a question about the relationship between information flow and material flow, a topic mentioned by Prof. Wagner. Though he raised a number of questions, this seems to me as the most important one: "Prof. Wagner has shown us information flow and material flow on the slides at the same time. Should these two types of flow model be produced by a company at the same

time? Or, should they be developed step-by-step independently from each other? Please explain the relationship between them."

Prof. Wagner, would you like to respond to this question?

Wagner

The way we approach this matter in the company projects is like this. We first start with the mapping of the material flows. Then we are interested to get closer information on each single material flow in terms of physical quantities and costs. We ask, "Where do we get this information from?" We look at the existing information systems because we don't want to get all new types of information which you have to collect by hand. We started mapping the existing information systems and we found out that it was a very useful tool to do a mapping of the information flows as well as we did it for the material flows.

This for us was a new experience too and for the people doing it in the company it was very interesting too because they discovered their own information flows on a visual basis and found things they did not know before. So we had a second tool suddenly develop, which we did not account for before when we started. We now could use both tools. We usually start with the material mapping and then we ask what kind of information in the information system is availing for the material flow. By this we improved the method for information flow mapping and improving, too. Today in some cases, especially in the service industries we also start with information flow mapping. I think this is the answer to your question.

Kokubu

Thank you. I appreciate your simple explanation to this very complex issue.

Mr. Tsuji from Kawasaki Heavy Industries raised another question about the methodology of MFCA. His question is about the necessity of paying attention to both energy flow and material flow. He says that energy has also much to do with the cost of environmental load. I think this question is related to the presentation by Prof. Wagner, Prof. Nakajima, and Mr. Okajima from Nippon Paint. Does any one

of you wish to respond?

Wagner

We do both, but there's an interesting difference between the two. When we work with bigger companies, they have ERP systems, small and medium sized companies often don't have ERP systems but their own information systems.

In the general ERP systems like SAP, Baan, Oracle or others, you find information on material, on each article of material and you can get this information out of the ERP systems. For energy, it's different. You have an energy input bill, where you can get information. Maybe sometimes you measure energy in flows. Today we heard about the Nippon Paint Experiment, which is a very good example on how you can do this in detail. But generally you don't have very good information on energy flows in the ERP systems.

So, there's a difference in approaching it but you can do the both steps one by one like I pointed out before. You start mapping the energy flow, then ask what kind of information do I have in the information systems concerning these flows. On energy generally, you get the information from other sources, not out of the ERP system. After that, you start going into Kaizen and ask how to improve energy efficiency.

As Professor Nakajima pointed out, the information mapping and the material mapping is first of all a communication tool. We use it as a mirror to show people, "This is your reality." They look at it themselves and they ask themselves, "Is that true that at this point we used so much energy?" And they come up with their own ideas on how to improve this situation. We don't give them advice. We just mirror, this is your consumption at this point and this consumption at that point. They find the weak spots and initiate the improvement by themselves.

Kokubu

Thank you. We shall move on to the next topic.

In short, Prof. Wagner says that energy flow is one of the important items that can be analyzed using the basic methodology of MFCA.

Even though we received more questions about MFCA, now I would like to look at some questions

addressed to Dr. Pojasek. After looking at some questions about the methodology of MFCA, it seems appropriate to look at some questions about the methodology of process mapping.

Ms. Nakao from Kwansai Gakuin University raised a basic question about process mapping: "When we draw boxes in a process map, shall we do it based on the results of new mapping activities or can we do it at each center prior to the process mapping?" Dr. Pojasek, would you please respond to this question?

Pojasek

Most companies already have process information that can be converted into hierarchical process maps. Process flow diagrams, piping and instrumentation diagrams, and flow charts are all good sources of information to prepare a preliminary process map. In some cases, I use information found in the literature to supplement the information provided by the company. This helps me to formulate many questions that will be resolved in the verification activities. There are two advantages that can be realized by this conversion to hierarchical process maps:

First, the process maps are much less complicated and never have more than six objects on a page. This helps workers and management to better understand the process. Other forms of process information are very confusing to use to communicate effectively to others.

Second, hierarchical process maps can be computerized with object linking software. A company can have a "book of maps" that link the processes and all of the supporting processes in a large system. These linkages between processes and supporting processes enable a company to leverage its "lessons learned" so there can be breakthrough improvements.

I typically prepare the preliminary process maps before going to the factory. The maps are used to gather information and search for opportunities to improve the process during the verification activities at the factory. This verification activity can take two days at a smaller facility and up to a week at a larger, more complex facility. The company helps to gather the materials for the Resource Accounting and Activity Accounting Sheets. I have used this Systems Approach process mapping technique in some very complex

operations and in some of the largest facilities of their kind in the world. I have prepared process maps for over 200 facilities. This process always teaches the people in the company new facts about their operations, especially with the linkages between supporting processes and the main process.

Kokubu

Thank you. As I understand, the uniqueness of this methodology lies in its basic procedure of continuously mapping out new boxes representing supporting processes for main processes.

Pojasek

Yes, this is true. However, the association between the main processes and the supporting processes is made visual. It is possible to allocate the resources used and lost by the supporting processes back to the work steps in the main process that are responsible for these uses and losses. Sometimes the main process can be changed to have a lesser need for a supporting process and still maintain its function. This can lead to resource conservation and lower waste.

There are many other uses of hierarchical process mapping. I think the visual nature of these process maps provide a better means of communicating the specific information from the process to all those who have an interest in the improvements that can be made in the process. From the point of view of material flow cost accounting, all the costs associated with the operation can be visually linked to specific work steps. It is at this lower level in the hierarchical process map where kaizen is applied. Furthermore, the uniform logic used in this process mapping methodology will help the users of material flow cost accounting to leverage and compare the results between processes and companies. All these things contribute to the uniqueness of this Systems Approach hierarchical process mapping technique with its Resource Accounting, Activity Accounting and Cost Accounting Sheets.

Kokubu

Thank you. Mr. Yoneyama from the Himeji Institute of Technology submitted a question in relation to this subject: "What would be a specific measurement for the process improvement that you mentioned? Does

the process improvement reach a higher level as the information system develops? What metrics has been used for measure the improvement?"

Pojasek

I am using a proven performance measurement technique known as the Baldrige performance excellence model. It is the same performance model used by the Japan Quality Award program <http://www.jqac.com/Website.nsf/NewMainPageE?OpenPage> This model is currently used in more than 60 countries, including the European Union. While you may recognize this model as an award program, the scoring of performance can also be used as a metric to track and trend process improvement. It has been demonstrated that companies that use this performance excellence model outperform financially the companies that do not use the model. This model scores a company in each of six performance categories and then scores the results separately before combining the scores within a 1000-point maximum.

The performance score increases as a company begins to provide links between the performance criteria categories. Further increases in the score occur with the company links its improvement efforts to the key business factors for the company. Integration of efforts and alignment with the business are very important drivers of performance and are reflected in this scoring methodology.

Remember that the performance score is a single number with no units. About 700 points out of a possible 1000-points puts a company in the excellence range. A company seeks to measure its continuous improvement using this score on an annual basis. Results (the large variety of environmental results are indicators that are volume and quantity driven) are scored by looking at the way the company plans for its results (planned versus actual), the way they are tracked and trended, and how they are benchmarked against other companies in the same business. Even the financial results from material flow cost accounting can be scored in this way. Remember, the actual results per se are not scored. Management never makes decisions on financial information in a vacuum. It has to be looked at in context. This performance excellence scoring method provides that context. Having

a single score is about as simple as you can get. Everyone can understand this. It enables different sized companies in different sectors to be compared on a uniform basis. A larger company could score its entire supply chain and compare these scores against its own operations so the entire enterprise is improved. I have written a number of pages on performance metrics that can be found on my Internet site <http://www.Pojasek-Associates.com>.

Kokubu

Thank you. I think that Dr. Pojasek's comments can be summarized in the following way: Even though accounting people may prefer figures given in dollars, it is acceptable to score the performance improvement expressed in figures. Dr. Pojasek's advice on performance scoring seems to reflect his experience at the EPA.

In environmental accounting, it is very important in the context of internal management in particular, that we pay attention to the metrics used in the evaluation of a particular environmental issue or management issue and how the evaluation of such metrics influences decision making. Environmental information often appears in the form of quantity, which usually makes it difficult to be utilized effectively in decision making. Exactly for this reason, Dr. Pojasek's systems approach and MFCA both have more practical appeal. Mr. Okajima and Mr. Kokuryo, do you have any comments on this point?

Okajima

As Dr. Pojasek pointed out, the environmental indicators may not be much help in making corporate management decisions. Quantity information cannot help decision making unless it is interpreted. Our trial implementation of MFCA is our first attempt to introduce a tool for converting quantity information into financial information or cost information.

I have a question for Dr. Pojasek about the performance scoring. What is the score that we should ultimately get? Should we continue to make efforts until we achieve the full score of 100 points? Or, is it acceptable if we score 80 points?

Kokubu

Yes. The question is about the criterion for judging

the score. Dr. Pojasek, could you respond to this point?

Pojasek

There are 6 criteria for scoring the performance. They are: Leadership; strategic planning; other interested party involvement, information and analysis, employee participation, and process management. The company using this performance metric must demonstrate that they are responding in positive fashion to questions in each of these categories. The answers can be scored by independent examiners using a scoring guide that is available on the Internet. The entire process is transparent. After the scoring is complete (this includes the score for the results), a feedback report is provided to the company to show them their strengths and where there are opportunities to improve. In a performance program, the company selects the areas it wants to improve in. The more that is done, the more points they can receive. This is quite different from a "conformance" program like ISO 14001. In ISO, the company must do everything, but only to a minimal level. There is no extra credit given for going beyond this level. There is a big difference between performance and conformance.

Kokubu

Thank you. Mr. Ando from Kobe University has a further question on the same topic, the criterion for judging the targets using financial figures or scores. Such financial figures or scores are meant to serve as metrics for measuring the process improvement. Dr. Pojasek, Mr. Ando wishes to know if you have seen any cases in which such scores are used in such an extensive way, that they may affect the assessment of the performance of managers in charge and the benefits they receive.

Pojasek

Performance measurement includes financial results as a component of what it measured. It is far more comprehensive using performance than if you restrict your analysis to financial information. Several companies in the United States (including Baxter International, Intel, Motorola, Eastman Chemical and Boeing), drive their operational excellence programs with the Baldrige

performance model. Their managers are compensated on how much improvement they can make in the performance score. Environmental professionals have not always been involved in these operational excellence programs. However, after the success of the Green Zia Program (a Baldrige model aimed at measuring environmental excellence and sustainability) in the state of New Mexico, USA, many more companies are beginning to see how they can use a prevention-based environmental program to build value in a company.

Kokubu

Thank you. We are now discussing matters related to intra-organizational procedures. I would like to invite other panelists to speak on this subject.

Kokuryo

At Kanegasaki Factory, where we recently conducted a trial implementation of MFCA, we had a similar experience to the one mentioned by Dr. Pojasek. At that time, we had a project team that specialized in energy conservation; they went to various sections in the factory with requests for improvement. With goals given in this way, however, we could not make as much progress as we expected. So we changed our policy, we encouraged people at production sites to make their own proposals and implement changes. We rewarded them for their accomplishments with incentives, monetary awards, and a special award from the division manager.

With such new system, people involved in production were able to make changes introducing their own ideas. This allowed them to perform experiments freely, for example, in the area of solvent recovery. This process consumes a great amount of steam as people in the chemical industry might be familiar with. We were using much more steam than was necessary to remove impurities from the solvent and lower them to a desired level. As a result of experiment, the following tasks were identified: reducing the solvent reflux ratio decreasing the heat consumption, and ensuring the quality of synthesized product. To carry out these tasks, not only the team in charge of the solvent recovery facility but all concerned personnel including the experiment staff cooperated, achieving

a drastic energy conservation which had been difficult to achieve earlier.

Kokubu

Thank you for the very concrete example of your experience. Prof. Wagner, do you wish to add anything?

Wagner

May I just comment on this one? You asked for possible consequences on salaries. We have examples like a company, Hilti, producing world wide drilling machines and similar equipment; they evaluate the performance of managers by a set of indicators. Maybe ten, and these indicators are visualized in form of a cockpit chart. You can see ten indicators on one page. Out of the ten indicators, six are economical indicators for performance measurement, the other four are environmental indicators. The managers salaries are linked to all ten indicators. This is very new company managers to be judged and rewarded by their environmental performance. Like amount of waste or energy consumption and so forth. What is important about this, it's not very easy to have an objective measurement even by environmental indicators.

For example, we used environmental indicators for benchmarking between companies or between operational plants in companies. If you want to compare indicators, let's say energy consumption per square meter, you have to be very clear how you measure these indicators. For example, square meters can be measured completely different. Do you include the walls? Do you include the hallway into the measurement? You can get quite different results.

Or if you compare indicators per capita, how do you count "capita"? How do you count your personnel? Do you include part time personnel? We had one company that had permanent staff of 200 people from IBM consulting for the whole year inside the company. Do you include those? How about the employees of the cleaning company, working every day in the company, consuming water, energy etc.? It's not very easy though it seems easy to count the number of employees.

If you want to do benchmarking, you have to be very clear on how you set up the basis for your indicators. We did this for example, for banks, in order

to do benchmarking with environmental indicators between ten European banks. It took them about half a year of intensive work just to agree on how to measure single indicators, how to measure per capita, how to measure square meters and so forth. So before you do benchmarking, before you vary salaries by indicators, one has to be very clear how to measure environmental performance, what indicators you use and how they are defined. After measuring physical indicators if you continue with cost indicators, like waste cost per unit or energy costs per unit, transferring physical indicators into cost indicators, this is even more difficult. Before you start the cost indicators you have to be clear on your physical indicators.

Pojasek

The way you score your indicators, and the way you score your results, is in this program. The Japanese National Quality Award, they don't care what your results are. The results are just for you. Here's what they care about. They care about, "Do you track and trend your results?", "Can you show a graph of your results?" and "Do you know why they go up and why they go down in every case?" If you do not know that, your score is low. But if you can explain all of those things, your score is high.

The next thing they look at is "Did you benchmark your results against other people in your industry?" There are some people that are very proud of the fact that they had a 70 percent reduction in something and everybody in their industry had an 85 percent reduction. Seventy percent looked very good, but when you benchmarked it, it was average to poor.

So, it's very interesting how they grade. They don't care what your results are but you do in your company. They score your results based on how you collected them, how you trended them, how you explained them, how you benchmarked them and you have to show continuous improvement of the results too and that gets a grade.

Again, I can take 40 pages of results from your company and give it a single numeric score. By the way, of the 1000 points, about 400 of them are for your results. So results are still the most important thing but the model does not care what your results are. I just want to know, "Do you really understand your

results and can you explain them and can you explain them in the industry?" Then you get a good grade.

Kokubu

Thank you. Unfortunately, we are getting short on time.

Mr. Yamamoto from IBM Japan has asked for examples of the systems approach applied in the area of environmental management. I hope that this request has been addressed by the number of examples given by now during our discussion.

Mr. Hirayama from IGES has asked for information about the number of companies that have adopted the systems approach, and about the popularity of this approach in the USA. These questions have already been answered by Dr. Pojasek during our discussion.

There remain two questions that need to be addressed. Both are rather difficult questions about MFCA. The first question is from Ms. Niiya of Benesse Corporation, "Is MFCA applicable to the service industry?" The second question is from Mr. Ueno of Matsushita Electric Industrial, "Is MFCA applicable to life cycle analysis?" Both questions concern the application of MFCA. Prof. Wagner and Prof. Nakajima, does one of you wish to respond?

Wagner

Of course, for service industry, it's difficult to do material flow accounting because in some cases they don't have much material flows. But this is relative. For example, looking at the banks closely, we were surprised how many materials flow they had. For example, we had a big bank. They had tremendously high energy consumption for heating, cooling, for computers and other technical equipment. They had a complete printing facility causing a big paper flow. Then they had a big amount of technical equipment flowing through the company. For example: We had one bank suddenly having a flow of waste of five thousand computers which they had to handle. So, technically in the service industry MFCA is possible and necessary but information basis often is quite poor. So the answer is, what we usually do in service industries, is the second part which I mentioned, we start with the information flow improvement. Because there is not so much emphasis on material flow, we

start with the second step, we go into information flow mapping.

We have done this for various kinds of projects in the service industry. Presently, we do it, you might be laughing, for a kindergarten. But this kindergarten has a sponsor and the sponsor asked them to be certified by ISO9000 and by ISO14001. So they asked, "How can we do an integrated version?" and we said, "Well, we can help you." The information mapping can be a very nice tool for integrating of the quality and the environmental approach. To get the various people who are in charge of it, talking and communicating along this information flow model. So, this is my answer. It can be very interesting to apply material and information flow mapping to service industries.

The next question was concerning life cycle analysis. As I told you, we are presently starting projects on supply chain management. In many respects supply chain analysis is nothing else, than life cycle analysis. But I have to say we don't have much experience yet. We are quite involved presently in doing material flow analysis properly inside the company. But as we proceed now and as we get better in this, we plan to extend this to a linkage between two or three or four companies. Each having done their own internal material flow accounting. If they are linked we get closer and closer to a supply chain, or life cycle analysis.

Life cycle analysis, to our experience, is a lot more difficult than generally expected. Because usually people are thinking of one product line, one material flow from cradle to grave. But if you start the life cycle analysis with an eco-balance, a mass balance in one company, you have 100 inputs maybe. These 100 inputs are a hundred flows coming from 100 suppliers. And each one of these hundred suppliers again has hundred suppliers. So in the next step along the supply chain you already have thousands of material flows and thousands of life cycle lines which you have to follow if you want to do a comprehensive life cycle analysis for all product materials. For all those thousand lines. So what you can do is you pick the most important ones.

But the whole notion of life cycle analysis is, when you get really close to it and you do it on the basis of a comprehensive mass balance gets very difficult,

by its methodology. There is not just one material line to follow from cradle to grave but thousands for a simple product. But I think the notion of the supply chain management, to link various companies doing material flow cost accounting, this will be a target of the future. It's very promising because the costs of material flows between companies are presently even less transparent than inside a company. Inside the company we find a lot of intransparency, so between companies it will be even more promising to find possibilities for improvement.

Kokubu

Thank you. Let us take five more minutes before we conclude the discussion. The subject of our current discussion involves a number of very difficult issues. Prof. Wagner speaks in the context of MFCA developed in Germany while Dr. Pojasek speaks in the context of systems approach developed in the USA.

What do these two methodologies have in common? On what points are they different? Are they mutually complementary or substitutes each other? In addition to these questions, it is also very important that we think about how we shall introduce them to promote environmental management in Japan. Prof. Nakajima, I would appreciate your opinion about this.

Nakajima

Talking with Prof. Wagner and Dr. Pojasek in this discussion, I reaffirmed several points. As I study MFCA and work with companies implementing MFCA, I have learned that corporate people involved in the MFCA project are very aware, as they might have always been, of their need to change, but in some areas, not yet sure about how they can change or what they should do. I feel what two methodologies presented today have in common is their potentiality to serve as a solution to their need.

Another common point between these approaches is that they offer solutions based on practical methodology as reflected in questions on the practical side of these approaches raised in today's discussion.

When I look at the differences between approaches of Prof. Wagner, Dr. Pojasek and myself, they seem to lie in how we would be able to implement these approaches based on the information provided under

a new body (new management and organization). This mechanism might be unique to the corporate culture of each company, and in a larger scale, unique to the culture of each region or each country.

Still, in the two case studies of Japanese companies, it seems to be common that we are not yet able to make full use of computerized 'information systems' as ERP though we have been using the term on a daily basis. Some parts of data collection and processing still involve some kind of work by hand.

In this respect, it is essential to integrate and share experiences in the three countries by enhancing communication as we explore valid means for making computerized information systems more useful for corporate management, in hope of developing them into management information systems.

Another point I would like to make here is that there is an implicit understanding in Japan that corporate activities include environmental conservation activities as one of the main roles, therefore it must protect environment in an effort to reduce environmental load. For a company to exist, however, it must make profits while being environmentally-conscious. Profits are the basis of a company's existence, without which it will not be able to continue its activities to reduce environmental load. I feel that future development of corporations should be directed toward making more profit while achieving environmental load reduction.

Kokubu

Thank you.

Although we have already run out of time, let us take a few more minutes to review the theme of our symposium today, "Cutting Edge of Environmental Accounting for Corporate Management and Environmental Conservation."

Among many environmental symposiums and seminars I have attended, this symposium has distinguishing characteristics from all the others held earlier in Japan. While attaching importance on environmental conservation, we covered in particular, corporate environmental management and discussed in detail.

Prof. Wagner from Germany, an invited speaker today, was originally a specialist in environmental conservation. His study about mass balance has led him into the development of MFCA, a concept that

can serve as the basis for an information system supporting a major corporate management system.

Dr. Pojasek is the pioneer of the systems approach. He has successfully applied the system approach to pollution prevention programs sponsored by Environmental Protection Agency (EPA) in the USA. In his speech today, he spoke of the systems approach as a valid method not only for the pollution prevention but also for the improvement of all types of processes.

In Japan, when we discuss the environmental responsibility of a company, environmental accounting or environmental management, we tend to emphasize the importance of environmental conservation and corporate responsibilities from a normative point of view. However, a company operates on logic that is not compatible with environmental ethics at certain points. It may be because of this incompatibility or dilemma that we must emphasize the importance of environmental conservation so much. I guess that some

of the audience feel the same way on this point.

Toward solving this problem, I suggest renovating corporate management in its entirety from environmental standpoint. As I understand, this is a core message of today's symposium.

I deeply thank you for attending our program today for so many hours since this morning. I also thank you for the number of questions you supplied; I regret that we did not have enough time to address them all. I regard this symposium as an opportunity to discover new issues and to go further, rather than an opportunity to conclude. In the morning session, we discussed the environmental disclosure as well. Our next challenge may be the use of MFCA or process mapping for better environmental disclosure. In this respect, I hope this symposium has provided you with some sort of hint in one way or another.

Thank you for being with us today. Guest speakers and other panelists, thank you for your contribution.