



## 3M: Waste Minimization

### Teaching Note

The 3M case provides an introduction to the use of nonfinancial performance measures in a manufacturing environment. The case is designed to be used in many different types of courses depending on the interests of the instructor and students. It can be used in a traditional managerial accounting course as part of a performance measurement module, in an environmental accounting course, or in an operations course. While much has been written about performance measurement, there is relatively little known about the use of environmental measures in industry. This case allows the instructor to focus on either the environmental issues or on performance measurement in when several measures are used. The following note is based on an 80 minute class discussion.

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The general issues that arise in the case include:

- The use of performance measures to communicate a corporate philosophy;
- The design of a performance measure;
- Trade-offs in the presence of multiple performance measures;
- Implementation issues in performance measurement systems.

For background reading for the students, the article by R. P. Bringer and D. M. Benforado, "Pollution Prevention and Total Quality Environmental Management," in R. V. Kolluru, (editor), *Environmental Strategies Handbook: A Guide to Effective Policies and Practices*, Prentice-Hall, 1994 pp. 165–188, might be useful.

My working paper, "Waste Minimization at 3M Corporation: A Case Study in Performance Measurement," University of Michigan, provides a cross-sectional analysis of results of the waste minimization program.

### Suggested discussion questions:

1. What is the role of the waste minimization portion of *Challenge '95* in 3M's overall environmental program? Compare and contrast this program with the 3P program.
2. What are the advantages and disadvantages of the definition of the waste measure selected by 3M? Can you suggest any modifications?
3. The *Challenge '95* program involves multiple measures of performance. What are the implications for decision-making at the plant? At the division?
4. Evaluate the reporting aspects of the *Challenge '95* program. What are potential problems?
5. What changes would you recommend to Tom Zosel and other managers at 3M for the next environmental performance measurement program?

### Discussion:

The case opens with a discussion of the corporate philosophy on environmental issues and a useful place to start, especially for those who want to emphasize the environmental issues, is with a discussion of the role of

the environment in a corporate strategy. For example, a quick overview of environmental regulations (see the NPPC's publication entitled *A Chemical Engineer's Guide to Environmental Law and Regulation*) will provide a background to the minimum level of environmental performance allowed. From there, the instructor can encourage a short discussion on why a firm might want to perform at a level greater than what is required by existing regulations. Some points that should arise from this discussion include:

- Marketing advantages of being perceived as "green;"
- Cost advantages of anticipating new, more stringent, regulations in the future;
- An environmental focus is consistent with quality initiatives to remove waste.

I do not allow this discussion to continue for long, so I can focus on the performance measurement issues. I ensure, however, that the point is made that ultimately the incurrance of costs and benefits associated with environmental performance are determined by the existing system of property rights. I leave the students with the point that for environmental costs and benefits that are not internalized by the company, there are valid questions about how the company should consider them in their decision-making.

Focusing more directly on 3M, I quickly take the students through the history of environmental activities at the company to get them to understand the relation between the voluntary programs, like the 3P program, and formal performance measurement programs like *Challenge '95*. A discussion on the advantages and disadvantages of voluntary and formal programs follows. Again, the purpose here is to get a general discussion about the nature of nonfinancial goals and the means available to achieve those goals.

Some of the advantages and disadvantages of voluntary programs that students have suggested include:

Advantages	Disadvantages
Indicates goals/cultural change	May not be given priority
Less incentive to bias results	Improvements tougher, take easy changes
Indicates employee support	May not be commonly held goals
Way to generate new ideas	

Depending on the interests of the class, this discussion can also consider the rewards for voluntary programs. This can generate an interesting debate about monetary rewards versus 'good job' recognition type rewards.

Then I turn to more specific questions and start with a discussion of the definition of waste. I start with a basic set of questions: what is included in waste, how is the waste measure defined, to ensure that everybody understands the computations. I also display Exhibit 4 (the 'double bubble') so that we can distinguish between what is considered waste for purposes of performance as opposed to what impacts the environment. (This is also a good place to tie environmental performance to quality measures since the idea is to reduce waste, not only to lessen the impact on the environment.)

I ask for the advantages and disadvantages of the waste measure. Some example responses include:

Advantages	Disadvantages
Encourages transforming waste to by-product	Different waste types are 'different:' - environmental impact - cost to treat - density
Easy to measure	Doesn't allow for changes in product mix
Takes scale of operation into account	
Provides quick feedback	

This discussion can last quite a long time as the students will bring out the tension between 'accuracy' and ease (cost) of measurement. I also try here to begin thinking about implementation issues by reminding them that there are roughly 80 plants affected by the program and these plants differ by process and product.

Another approach that can be taken here (although I have not) is to get the students to think about the incentives that this measure provides for various types of decisions. One reason I do not do this (in addition to time) is that there is very little in the case on (1) the role of the performance measure in manager evaluation and compensation, and (2) the authority of the managers to make various types of decisions (e.g., make vs. buy).

The next issues covered are allocation and reporting. The allocation issues take little time — there is little information in the case beyond some allocation approaches. More time can be spent on the reporting issues. I point out that cost and cycle time information goes to one staff group while waste and energy information goes to another. We then discuss the interdependence of the four measures and the difficulty of doing analyses on the trade-offs if different groups receive information. This is a good place to also have a discussion of the role of multiple measures versus a single measure (e.g., costs) and the benefits of non-financial performance measures relative to financial measures.

I end by asking for suggestions of ways to improve the system for the next iteration of the program. Often suggestions involve changing the waste measure to

reflect cost or toxicity, disaggregating the waste measure by type of waste, and using a flexible budget approach to account for product mix changes. The other suggestions tend to be administrative, such as: formalizing the feedback loop for product design, reporting to a single corporate source, and eliminating allocations. These suggestions allow for a discussion of implementation issues as well.

I conclude the class with the following summary:

**The 3M case illustrates:**

- The operation of an environmental performance measurement program
- Performance measurement definition issues
- Administrative design issues
- The role of nonfinancial performance measures in control systems

**The 3M program is an example of how the management control system in a decentralized organization can be used to:**

- Communicate corporate strategy
- Provide information to managers for decision-making
- Provide an mechanism for measuring subordinate performance



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