IN-PLANT APPLICATION OF THE SPA

Requirements

A minimal number of stakeholders are needed to see to the introduction of pollution-prevention practices in a plant's day-to-day production activities. Plant managers should make one person responsible for implementing these activities. This individual will function as a co-ordinator of the plant's pollution-prevention activities, collating all the information gathered on production processes, organizing meetings with certain production units, and determining the training requirements of operators and personnel. The co-ordinator is an important link between plant administration and production staff.

The resources necessary to the successful completion of the SPA in its entirety can be summarized in five points. Plants must:

- identify a co-ordinator to oversee application of the process audit
- establish an effective method of data collection (for energy and mass balance budgets) to ensure the continual, long-term monitoring of operations
- select economic and environmental indicators that best represent the plant's situation
- benefit from the experience of operators in the joint development of specific steps for each production unit
- obtain continual feedback and input from employees to adjust, as appropriate, the remedial measures being introduced, keep track of the resulting environmental and economic benefits, and ensure that the initial impetus for the initiatives taken is not lost (evolving process).

Implementation

A shift in production attitudes must accompany implementation of activities recommended by the Simplified Process Audit. This task may appear simple at first glance, but it is often the most difficult step of all. In fact, the success of the approach is directly related to employee participation in the process.

If the co-ordinator has involved personnel and gotten regular feedback from them right from the outset, the process is very likely to succeed and the initiatives identified during the audit are likely to be applied.

Moreover, the following three points must be borne in mind throughout the implementation process:

- Keep initiatives simple.
- The approach is an evolving one.
- Remedial measures should, as much as possible, be initiated by production unit operators.

To this end, operators must be willing to adapt to modifications made to their production units as a result of the process audit. Also, the selected economic indicators should be able to reflect environmental advances made by the plant.

INFORMATION

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Canada

Simplified Process Audit (SPA) – Methodology

"P2 Fact Sheets" provide a showcase for the pollution prevention projects of Canadian companies, and reflect the sustainable development priorities of the Government of Canada. They are intended for companies, industries, agencies and individuals interested in the economic and environmental benefits of in-house pollution prevention activities.

In the face of burgeoning market globalization, Canadian companies are having to prioritize their activities to remain competitive. The process audit is an approach that marries economic and environmental aspects in a way that companies profit by the adoption of pollution prevention measures.

The Simplified Process Audit (SPA) was developed by Environment Canada – Quebec Region, and serves as one of the reference tools used in federal pollution prevention programs affecting Canadian companies. This first fact sheet in the series describes the audit methodology and its in-plant application.

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P2 Fact Sheets

In-Plant Pollution Prevention

Simplified Process Audit (SPA) – Methodology

ABSTRACT

The environmental management of industrial facilities constitutes a major challenge for business. Market globalization, increased competition and better product quality mean that cutting-edge technology is vital to enabling Quebec industries to penetrate today's marketplace and export their products and services.

Industry needs simple and effective tools to reconcile production demands with sound environmental management. The Simplified Process Audit (SPA) offers a solution.

The Simplified Process Audit (SPA) allows plant administrators to foster a pollution prevention approach based, in part, on economic considerations, but focused primarily on environmental concerns.

This preventive approach will not necessarily eliminate the need for a given end-of-pipe wastewater to be treated. It will, however, make it possible to quantify the attendant savings in raw materials and waste disposal costs and in improved energy efficiency, among other benefits.

The SPA can produce substantial benefits and may even generate profits, which can then be reinvested in the plant to boost productivity. Using a step-by-step approach, plant hot spots are targeted, the necessary improvements made, and the results measured. The process then comes full circle: any profits or savings are funneled back into resolving whatever problems were identified at the outset, in order of priority.

Government of Canada Gouvernement du Canada

OBJECTIVES OF THE SPA

To bring about genuine attitudinal change at the industrial level and to demonstrate the importance of the environment to preventing pollution, the following three statements of principle should be part of a plant's management strategy:

- Tools to measure environmental performance should be based on the expectations of both internal and external clients.
- Environmental considerations should be part of plant production operations.
- There must exist a motivation to invest in the environmental performance in the long term, rather than an expectation of recovering costs in the short term.

These three statements of principle form the basic objectives of the Simplified Process Audit. They fulfill genuine needs with a view to fostering a pollution-prevention approach based in part on economic motivations, but primarily on a desire to improve the environment.

Successful application of the approach depends upon the participation of workers involved directly in production. The benefit of their experience is key to introducing these simple, effective and functional pollution-prevention measures.

The SPA will permit plant administrators to select the most beneficial environmental projects in technical and economic terms. The process was developed by Environment Canada – Quebec Region and reflects the sustainable development priorities of the Government of Canada.

BACKGROUND

To encourage proactive pollution prevention, a logical approach based on mass balance and energy budgets is employed to identify the priority sectors in a given plant.

The execution of these budgets frequently requires a thorough understanding of industrial processes, along with an exhaustive quantification and characterization of all plant effluents.

The Simplified Process Audit proposed here is holistic in that it integrates environmental, social and economic considerations. It should enable plant administrators to make enlightened decisions on the necessity of investing in pollution prevention rather than simply acting after the fact. In this way, they can avoid needless costs, be better able to determine the type of treatment equipment to install, and, most of all, quantify the benefits of such an approach (savings in raw materials and waste disposal costs, improved energy efficiency, etc.).

The SPA can lead to substantial savings and may even generate profits that can then be reinvested in the plant to further enhance its productivity. Using this step-by-step approach, it is possible to first target plant hot spots, make the necessary improvements, measure the results obtained, and then, using the profits, come full circle and deal with problems in order of priority.

METHODOLOGY

The SPA takes place in nine simple and logical stages:

1) Process initiation

- Identify existing plant problem.
- Identify team members.
- Plan staff involvement (assign roles).
- Set project timetable/deadlines.

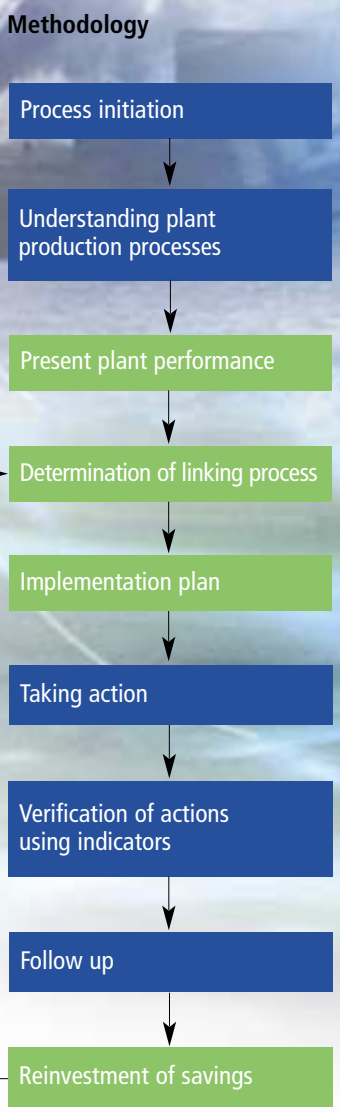
In Stage 1, the plant identifies its environmental problems and determines the extent of the resources it wishes to allocate to improving its environmental management. Personnel involved are identified and timetables set for completion of the process. It is imperative that employees have responsibilities within the process from the very outset, in order to fully exploit their knowledge of unit processes and benefit from their advice.

2) Understanding of plant production processes

- Mass balance budgets of production units (outline inputs/outputs of unit processes):
  - raw materials
  - energy
  - carrier medium
  - wastes (water, air, residue)
  - products and byproducts.
- Characterization if necessary.

Stage 2 is the cornerstone of the environmental audit. Mass balance budgets of the different industrial processes provide an overview of all inputs and outputs, thereby making it possible to better target those units experiencing major losses of raw materials or energy, to assess the nature and the extent of toxic wastes, to identify those areas where the environmental impacts of wastes are most marked, etc.

Certain production units may require more thorough characterizations to ensure that those parameters of particular interest are assessed precisely. In such cases, a sampling program may yield the greatest amount of information possible to balance the budgets established.



3) Present plant performance (indicators)

- Economic indicators:
  - Cost of raw materials
  - Cost of waste disposal
  - Residue mass by product
  - Environmental and energy costs by product.
- Environmental indicators:
  - Environmental compliance (regulations)
  - Effects on the environment (physical, chemical and biological indicators).

Stage 3 employs simple economic and environmental indicators to quantify a plant's performance as a function of assigned values. The environmental-compliance indicator is considered a base performance level already achieved by the plant. The environmental indicators assess the effects on the environment of various wastes according to the type of bioassay or bioindicator selected. The economic indicators serve to measure production yields according to the amount of raw materials used, waste generated, energy consumed, etc.

4) Determination of linking process

- Understand production processes (mass balance and energy budgets).
- Understand cumulative impacts of processes on product.
- Prioritize actions in consideration of environmental impacts.

Stage 4 is crucial to prioritizing the initiatives to be undertaken. It is at this stage that a decision must be made about which production unit requires urgent action so as to minimize the impact on the environment, on the one hand, and to minimize the investment required, on the other. The complete assessment of inputs and outputs must have been performed and all the possible synergistic impacts of the processes on the finished product understood.

5) Implementation plan

- Determine new environmental-compliance objectives.
- Understand technology behind processes and equipment.
- Understand possible (nontoxic) substitutes for inputs used.
- Draw up an in-house code of good environmental practice.

At this stage, the work essential to implementation of process initiatives should be determined. It may now be necessary to schedule a few pilot tests to evaluate the choices made in Stage 4. Further, a code of good environmental practice should be drawn up. Employees should have access to all this information in order to obtain their feedback before implementing certain remedial measures.

6) Taking action

- Implement the remedial measures identified.
- Obtain the necessary human and financial resources.
- Ensure employee training.

Stage 6 is where work on the linking process truly begins. With proper planning the anticipated results will not be difficult to achieve. Again, and as at every stage, staff involvement is critical. Among other things, they must receive proper training and be able to participate in the implementation process.

7) Verification of actions using indicators

- Assess performance using indicators described in Stage 3.
- Note impacts on final product.
- Record progress to date.

During Stage 7, any improvements attributed to the actions taken in Stage 6 are measured. Environmental and economic advances are revealed using Stage 3 indicators. Impacts on the finished product are carefully evaluated and the appropriate adjustments made.

8) Follow up

- Publicize the results.
- Obtain employee feedback.
- Conduct a cost-benefit analysis.
- Perform a comparative analysis (internal and external).

The Stage 8 follow-up phase is where results are made known, final staff feedback obtained, and comparisons with other competing or associated plants made.

9) Reinvestment of savings

- Retroaction (return to Stage 4).

The ninth and final stage demonstrates the dynamism of the Simplified Process Audit. If the initiatives do result in savings for the plant, this money should be redirected, starting from Stage 4, into an other production process where improvements might be made. The process thus becomes a closed loop whereby savings can be generated for reinvestment in concrete pollution-prevention initiatives until the environmental and economic benefits of these initiatives become negligible.