

STRATEGIC APPROACH TO LONG-TERM ENVIRONMENTAL ACTION

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As part of the environmental authorities the RIZA-institute in the Netherlands stimulates industry to anticipate the best future production techniques that fulfil both economic and environmental challenges. Looking some 10 to 20 years ahead a number of clean technologies can be discerned that are quite promising. However, implementation of these can only reach its full potential when a number of non-technological issues are addressed. It is shown that an environmental authority can play a substantial part in this.

From times on the RIZA-institute acts as a consultant to the Dutch water boards regarding industrial discharges into surface waters. Because of its central, national position, and as part of the Ministry of Transport, Public Works and Water Management, the RIZA-institute has acquired a good overview over waste water discharges from a broad range of industries as well as over techniques to curb the associated emissions.

Presently the situation regarding emissions to the Dutch surface waters can be sketched as relatively good under control, with only a limited number of discharges directly posing threats to the aquatic environment. Thus, as the need for short term actions has relaxed, space is given to a more fundamental rethinking of industrial processes. To that purpose RIZA has initiated the program Clean Technology, in which it identifies possible (technological) break-throughs that may be adopted by industry on a time scale of 10-20 years.

The objective of this program is to enhance the use of changes in process and/or product design within industry that have a positive effect on both economic and environmental performance. Improvement of the environmental performance alone is judged too small a driving force for companies to change their production process. Overthrowing a production process simply is too far-reaching. Moreover, when thinking of the future many companies do not worry about their environmental performance; they most of all worry about their existence in a changing world with growing competition. In that respect, product and/or process improvement and the necessary upgrading of process knowledge is the key element that can bring environment and economy together.

RIZA does not try to force industry into implementing clean technology by means of restrictive discharge permits. Licensing discharge permits has proven to be effective in the Netherlands to reduce emissions to surface waters but as a new generation of environmental action is promoted other methods have to be used. Now, the challenge is to change-over to actions that have less obvious benefits, are less quantifiable and which demand another organisation of relevant process and technological knowledge. This challenge goes out to both government and industry.

The role that RIZA sees for itself has two elements:

- to take care that information about future technological innovations reaches industry.
- to bring together relevant parties: industry, public authorities, knowledge suppliers.

In order to disseminate information on future technologies RIZA performs feasibility studies in which promising techniques are assessed with respect to their applicability in Dutch industry. This assessment is partly technological in nature (does it really work, which constraints have to be considered) and partly economic (is it affordable, which

non-quantifiable benefits can it bring). Very often, even in the case of seemingly futuristic concepts, technology is not the bottle-neck: technology often is already available, or remaining problems can be overcome by relatively limited engineering efforts. Economic constraints neither are limiting; often they just define the application field of technologies; is it fit for industry-wide application or is it restricted to special niches within markets?

What really seems to be a limiting element is the organisation of information on innovations that may be relevant for individual companies. By information we do not only mean technological knowledge but all information that an industrial enterprise needs in order to evaluate process or product changes. This information also includes e.g. data on the actual process layout in a company or existing technological solutions in other industries. This information can be gathered from a great number of parties both from in- and outside of the company; production staff, board of directors, suppliers of additives and process equipment, public authorities. A potential problem is that these parties not always have parallel interests. Also, these parties have to recognise each other's relevance to the process of innovation.

The fact that the organisation of the information appears as a bottle-neck in the process of adoption of innovations in a way legitimises that a government institute like RIZA can take a part in the process. Of course, it is the task of individual companies to establish environmentally sound production for now and in the future. Government bodies hardly have the information nor the expertise to judge which process innovations may be of relevance for individual companies. However, they play a decisive role in the process of innovation as they can exert their influence over a great number of parties in policy areas as environmental performance, workers protection or economic regulation. So, government bodies are a serious counterpart as for an industrial enterprise of the many things in life one thing is certain: in 10-20 years time there will still be a government.

There are two important subjects in the program Clean Technology:

- replacing 'wet' processes by 'dry' processes
- closing the water loop for those processes where water is to remain the process medium

The choice of these water related topics evidently comes from the institute's relation to waste water discharges. Of course, this shouldn't lead to a water oriented shortsightedness. By using environmental assessment methods like life-cycle analysis an optimal outcome for all environmental compartments is guaranteed.

In the field of replacing wet processes by dry processes our efforts have concentrated on the application of supercritical carbon dioxide (CO₂) as process medium. At pressures of a few hundred bars the density of this gas has reached such a level that it can effectively dissolve a broad range of substances. As a pressure depended process medium is created in this way, lowering the pressure will release the dissolved material. This often occurs in a pure form, enabling re-use of the material.

A feasibility study on supercritical dyeing of textile fibres has shown that there are no major technical barriers: the technology is proven on a lab-scale and the necessary process equipment can be purchased off-the-shelf at specialised firms. The expected economic performance was very good as cost prices of the dyed textile fell in the same range as for standard dyeing techniques. The main limitation for wide-scale implementation of this technique proved to be the fact that at present only fabrics of 100% synthetic fibres can be dyed by the supercritical technique. Research is going on to extend the technique to natural fibres. The textile finishing industry is interested in the supercritical technique as it may give them the opportunity to stay ahead of the

international competition, e.g. by producing new products.

Presently the feasibility of supercritical techniques in chemical processes is under study. The production of ethylene glycol is taken as an example. In cooperation with Shell Research an assessment will be made whether the potential benefits (amongst others a higher selectivity) outweigh potential drawbacks like the elevated costs of process equipment.

Regarding water loop closure in industrial processes an increasing interest from industry can be discerned. Until recently, the concept of water loop closure was dismissed by industry as highly unrealistic. Over the last few years, under the threat of rising costs for groundwater abstractions, if not potential abstraction bans, industry has taken up the concept of water loop closure as a goal it has to work up to. Several initiatives have been taken up ranging from re-use of effluent on a regional basis to closing up individual companies.

The environmental benefits of water loop closure are evident. Also, substantial improvement of economic performance can be realised. On the one hand the costs of water consumption and waste water discharge will be avoided, on the other hand in those processes where products come into contact with process water cleaning-up the water cycle will provide opportunities for product improvement.

Presently RIZA is running projects in the paper and board industry, electroplating industry and the food processing industry.