

## SUCCESSFUL USE OF SABENTO TO EVALUATE A METHOD FOR SURFACE RUST REMOVAL

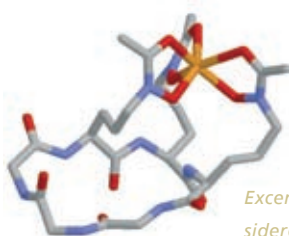
### THE TASK

Currently used etching methods for rust removal from metallic surfaces cause technical and health problems for operators. In order to address this issue, the goal was to develop a gentle and efficient method for the removal of corrosive layers based on biotechnically developed siderophores (microbial iron chelators). Sabento was used to assess the chances and risks at developing this method in advance at the basis of a biotechnical model.



Rust mainly consists of  $\text{Fe}_2\text{O}_3$  molecules, which have a trivalent content of iron. Some microorganisms are able to use microbial chelat builders (siderophores) to absorb  $\text{Fe}_3^+$  ions with high affinity and to thereby remove rust layers. The chances and risks of this biotechnical process are analyzed in three steps:

1. Economic process evaluation
2. Ecologic process evaluation
3. Social process evaluation



Excerpt of a  
siderophor-iron-complex  
Source: Technical Uni-  
versity of Darmstadt

### Economic Process Evaluation

Within this step, the economic efficiency of the planned rust removal method is assessed. This can be done already in an early stage of development, and it encompasses a global examination of the process and also a local examination of specific process elements. Once the materials and process steps that create the highest costs are identified, this knowledge can be used for optimization purposes in later process planning stages. The following performance indicators are determined:

- Contribution margin
- Profit
- Return on investment
- Payback period

### Ecologic Process Evaluation

During ecologic process evaluation, materials are classified according to their environmental effects such as toxicity and global warming potential. The ecologic specifications and indices of each material are collected and evaluated. Further, the material and energy flows that are aligned with the future production process are visualized.

ASA Special Enzymes GmbH is a company that develops, produces, and globally distributes enzymes, microorganisms, and other biotechnical products. Its product range addresses the following industries: food-stuffs and food processing, bio-sensors, organic production, as well as textile and paper production.

In order to maintain and continuously increase the high quality standard of its products and production processes, the company puts a main focus on its research, development, and innovation activities.

**CUSTOMER TESTIMONIAL**

*"I value the program to be a general success. For ASA Special Enzymes and other biotechnology SMEs it can be a very useful additional instrument for the evaluation of projects, methods, and products. The evaluations of a process can be done independently of each other, according to individual requirements, and reveal the points for further process optimization. Economically, ecologically, and socially critical circumstances can be detected during process design. The results of the evaluation are compactly and transparently displayed and can be used well for internal and external communication. Especially when talking to customers or when presenting projects to potential investors, it seems to be sensible to me to use these results as additional arguments."*

Dr. Arno Cordes,  
ASA Special Enzymes GmbH, 2006



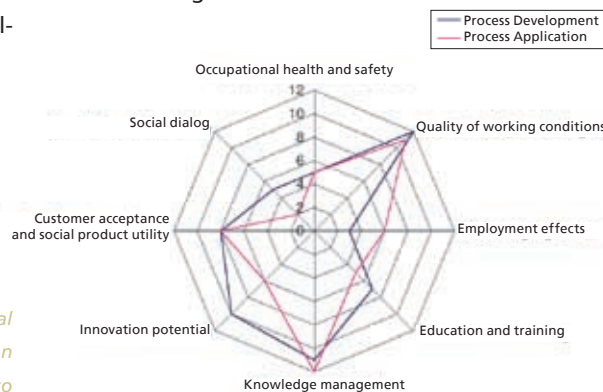
**Social Process Evaluation**

Biotechnology counts as a key technology for a sustainable development in the manufacturing industries. Unlike traditional etching methods, the evaluated product is less burdening for the operator, since no noxious highly-concentrated acids are used.

Sabento uses the details of the process modeling and the entries made in the evaluation assistant as a basis for the social assessment. It includes an overall and individual evaluation of the following aspects:

- Occupational health and safety
- Quality of working conditions
- Employment effects
- Education and training
- Knowledge management
- Innovation potential
- Customer acceptance and social product utility
- Social dialog

*Results of a social process evaluation with Sabento*



**MEASURABLE RESULTS AND BENEFITS**

**Economic Evaluation**

As a result of the preceding analyses a high profit for the product line, with a payback period of 3.4 years is forecast. Optimization potentials related to investment costs and material costs for important raw materials can be easily identified. The turnover that can be realized through the sale of etching powder amounts to about 34 mio. Euro per year. Taking into account variable costs of about 15 mio. Euro, the contribution margin amounts to more than 19 mio. Euro. With fixed costs at the order of 8.5 mio. Euro, the resulting profit is more than 11 mio. Euro. This amounts to a net profit ratio of 32.2 %.

**Ecologic Evaluation**

To produce 1 kg of product, approximately 1000 kg of material are needed on the input side. The energy requirement is 17.5 kWh/kg and the amount of waste water is one million cubic meters per year. A further result is that none of the materials used in the process is classified as ecologically precarious.

**Social Evaluation and Knowledge Management**

Because of the research intensity in biotechnology, knowledge management is an important factor of production, which makes an elementary contribution to the success of a company. Part of that are processes for the creation, collection, distribution, development, and application of knowledge. Knowledge management of ASA Special Enzymes has been awarded 11 out of 12 in the process development phase, and 12 out of 12 points in the process application phase as a result of the social assessment.

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