

# Developing a product safety data base for improved business process support in environmental and safety affairs

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## **Abstract**

Substance data on product safety, environmental protection, and industrial health belong to the core of knowledge of chemical industry. Nevertheless, in many companies there is an urgent demand for reorganizing these data in order to solve problems inherent in them, and to meet future business challenges. To this end, BASF Ludwigshafen has started a large software and organizational project named **BASIS**. The main element is to establish a central exchange facility for EH&S (Environmental, Health and Safety) data which ensures the use of the same actual, complete, and consistent data throughout the enterprise.

As a technical platform the SAP R/3 system was found to be suitable. After assessing similar interests, BASF AG, Hoechst AG, SAP AG, and TechniData GmbH joint to start the EH&S cooperation for developing the necessary software based on SAP R/3 in early 1995. We shall describe the functionality of the EH&S module, and the schedule of EH&S releases. The introduction of EH&S as the core of **BASIS** will be facilitated by a package supplementing the most required company-specific functionality. We shall close with an outlook on some topics of integrating **BASIS** into business processes.

## **Keywords**

Substance data, product safety, industrial health, environmental protection, information systems, system integration, business process support, SAP R/3, SAP EH&S module.

## 1 PRESENT SITUATION AND PROBLEMS

Today, the lifecycle of any chemical product from its birth at the laboratory to its use or disposal is accompanied by a multitude of information on its safety and environmental effects. Therefore, data on environmental protection, industrial health, and product safety (further on summarized as EH&S) are essential to the producers in chemical industry as well as to any customer using chemical substances and products. Nevertheless, as several events have proven, the handling of those data seems to be difficult, despite of the fact that many companies have spent a lot of money on traditional and DP support for this handling. The problems even seem to grow, and internal as well as external information needs from customers, administration, and society seem harder and harder to fulfill. For several years, all new solutions only seemed to deepen the problems. They have led to a multitude of data collections, data bases, and isolated modules without any control of data consistency. For instance, our company presently uses about 40 information systems for handling EH&S data.

Only with the emerging of the methods of business process analysis and business process reengineering we have gained a deeper understanding why the old solutions didn't work, and how to address the problem to solve it. We now have learned that the main reason for these problems is the functional orientation of present data organization, lacking consistent support of business processes. The data availability is not business process-oriented, but usually the EH&S data are spread all over the company. As a consequence, the business-oriented information flow is mainly carried by paper or telephone calls. This is a typical situation in a highly distributed world of autonomous and strongly heterogeneous systems. There, no consistency control allows for checking against errors in redundant data. A company-wide search for data is not thoroughly supported. Access is either granted or rejected, no dedicated security measures can be enacted. As far as data are already held by means of DP systems or data bases, a variety of user interfaces is a burden for any potential user.

## 2 THE *BASIS* PROJECT

Therefore we have seen the necessity to improve the EH&S data situation and have initiated a large DP and organizational project named *BASIS*. This is the acronym for „BASF-wide Substance and Product Information System for product safety, environmental protection, and industrial safety“. Presently, there are 19 team members working full-time on the project, plus over 100 experts from all divisions backing up the project team with their knowledge.

The objectives of the project are to remove the disadvantages of functional orientation of data organization and replace it by a consistent support of environmentally relevant business processes. The main element is to establish a

central exchange facility for EH&S data which ensures the use of the same actual, complete, and consistent data throughout the company. The system must be able to handle all substances and products existing at BASF. Access should be regulated such that anybody who needs EH&S data for business gets the information, but the security of confidential data must be absolutely guaranteed at the same time. And most important, the new system must be integrated into the business processes and with other existing or new DP applications handling EH&S data.

### 3 CONCEPT AND BENEFITS

The requirement of integration in the business processes and with other systems directly leads to a system architecture which emphasizes the data exchange character of the new facility, thus providing the integration of existing data collections and the supply of data to the operative systems supporting the daily business.

The scope of *BASIS* is worldwide, with an emphasis of supporting business processes in Europe during the first steps of completion. The Ludwigshafen installation will serve Europe, whereas other regions of the world are assumed to have their own installations. Since all installations will use the same technology and data model, exchangeability of data between them will be assured.

Despite of the firm limitation of the project to the data areas of EH&S, there are 500 properties of substances and products yet to be accounted for. Their inclusion and priority is guided by the results of the business process analysis. The data are grouped in areas of related subjects, resulting in typical clusters like administration, composition and registration, physical-chemical properties, ecotoxicology, toxicology, storage and transport, and more.

The selection of a suitable system platform for *BASIS* was guided by the requirement of compliance with the BASF standard application environment. Together with requirements from software development and internal support the decision clearly fell in favour of the R/3 ABAP system platform. Since we expect to migrate more and more operative systems from the old self-developed solutions to R/3 modules, this choice immediately assures technical integration of the EH&S data infrastructure into the future operative platform.

From the realization of the data exchange architecture a multitude of benefits is expected, including cost reduction in data maintenance, reduction of paperwork in business operation and protection of former investment in data through incorporating existing data collections into the *BASIS* network. Also, autonomous and isolated local solutions will become obsolete by using the new infrastructure.

Beyond this technical view of benefits, several important far-reaching beneficial effects are expected from carrying out this concept. From improved data reliability and accessibility, the safety of business operation, legal compliance, and

emergency response will profit. A better and controlled data distribution will allow faster customer information and will support a higher flexibility on the market.

#### 4 THE EH&S COOPERATION

The steering committee of *BASIS* commissioned the task to the team to look for chances to carry out the project as a cooperation with external partners. The reason for this mission were the advantages seen in cooperating with partners from chemical as well as software industry (Schuh, 1996):

- sharing of development costs;
- join of chemical expertise and software know-how;
- promoting a standardization of EH&S data structures.

The desired cooperation has been successfully established in early 1995. As an expertise partner from chemical industry, Hoechst was found, together with BASF covering a broad range of chemical industry BP and EH&S data. Both joined with SAP who wanted to start to develop an EH&S substance data base module within R/3. With SAP as the software technology partner, maximum competence in R/3, and especially in the interdependencies of the new module with other areas, is brought in. In addition, with TechniData a development partner known for substance data base experiences has joined the cooperation.

The standardization drive of SAP modules and projects is clearly observable, hence immediately redeeming the desired effect. Generally, the scope of standardization reaches from the data meta model, the property modelling, and common phrases up to a future where a data base with predefined substances or even generally accepted values measured by established institutions might be purchasable. A data base standard like EH&S would be the prerequisite for this.

#### 5 FEATURES OF THE EH&S SUBSTANCE DATA BASE

The functional concept of *BASIS* distinguishes between three complexity levels (figure 1): Basic data base functions, complex data base applications, and business process (BP) support.

The basic data base functions ensure a working data base, allowing to define data sets and their keys, user profiles and access, and providing auxiliary modules. The complex data base application level is where the regular user does his business tasks. The functionality offered centers around maintaining and retrieving the substance properties themselves. At the BP support level you find the measures for putting the processes together using the level 1 and 2 building blocks.

The functionality of EH&S will cover most of the *BASIS* first and second level, hence leaving exactly the company-specific third level as an individual task (and the chance to turn EH&S into a specific business asset) to any company. New basic SAP R/3 components like Workflow and ALE fill the last remaining gaps.

<b>BASIS: Planned Coverage by SAP R/3 and EH&amp;S</b>									
Level 3 Business process support	Emergency response		Hazardous goods classification		Product registration		...		
Level 2 Complex data base applications	Query and evaluation	Substance data maintenance	Validation and uses	Report generator	Data history	Data subscription service	User access administration by data owners		
	<i>EH&amp;S</i>	<i>EH&amp;S</i>	<i>EH&amp;S</i>	<i>EH&amp;S</i>	<i>R/3</i>	<i>SAP WF</i>	<i>EH&amp;S</i>		
Level 1 Basic data base functions	Multi-lingual Support	Key identifiers	Client capability	Non-Substance data maintenance	Versioning	Data archive	Application interface	Bulk data import/export	User profile administration
	<i>R/3</i>	<i>EH&amp;S</i>	<i>R/3</i>	<i>EH&amp;S</i>	<i>R/3</i>	<i>R/3</i>	<i>ALE</i>	<i>R/3</i>	<i>R/3</i>

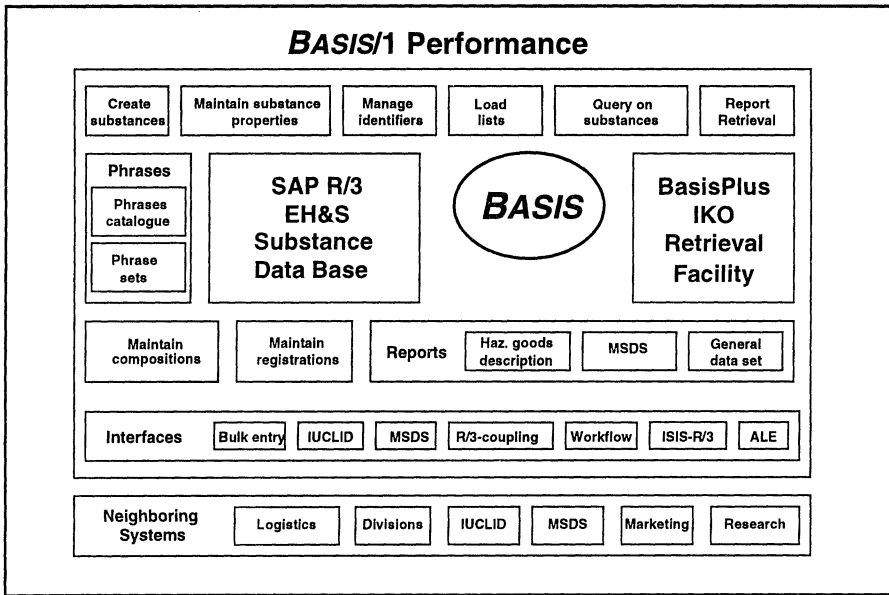
**Figure 1.** Planned coverage of *BASIS* by SAP R/3 and EH&S.

In addition to the functionality shown in figure 1, EH&S has several nice features expected from a powerful substance data base (SAP, 1996a). One very special asset is its ultimate flexibility. All kinds of substances and keys are definable, dynamical data structures for substance properties allow fast addition of new ones, and the user interface is workplace-specifically customizable.

## 6 SCHEDULE OF EH&S RELEASES AND *BASIS* INTRODUCTION

The first market version of EH&S was part of the SAP R/3 3.0E general release and is available since August 1996. Features like predefined reports, enhanced report handling mechanisms, integration to the logistics module R/3 SD and several enhanced property maintenance and retrieval functions are planned for later R/3 releases. The major development of the EH&S substance data base will be concluded in 1997. Beyond this, the perspective of the EH&S software is a general environmental management system, featuring modules for supporting the

fulfillment of EH&S tasks like monitoring, reporting, and legal compliance along the whole product life cycle (SAP, 1996b).



**Figure 2.** Augmented functionality package for *BASIS/I* introduction.

In order to adopt to the release schedule of EH&S as the core module of *BASIS*, we have defined a package named *BASIS/I* for introduction at selected pilot divisions at the Ludwigshafen site (figure 2). By this strategy the most required functionality can be brought to the users as soon as possible. *BASIS/I* includes substance property maintenance, an enhanced BASF-specific retrieval component, and interfaces to the most important data collections.

## 7 INTEGRATING EH&S INTO BUSINESS PROCESSES

Besides taking part in the requirements analysis and development of the EH&S module, customizing it for its use and introducing it in BASF are the main tasks of the *BASIS* team. With the concept of *BASIS/I* we have provided the technical ground for starting the introduction. As the next step the integration into BP has to be initiated. Product registration and hazardous goods classification will be the first two BP to be supported by the EH&S module implemented in course of the *BASIS/I* package. For the whole *BASIS* project, all subprocesses of the product lifecycle will be thoroughly analysed.

As already mentioned, the specific way of integrating a standard software like EH&S into their BP is the chance of every company to turn it into a business asset. Hence details of BP integration must not be publicly disclosed. Nevertheless, we shall give some generally valid hints on our procedures in the talk.

## 8 CONCLUSION

By the **BASIS** project a long-lasting problem of chemical industry is addressed and will be solved at BASF. The consistent support of environmentally relevant business processes with EH&S data will bring a multitude of benefits. These include cost reduction in data maintenance, and improved general business operation. Prerequisite of these benefits is the availability of a powerful substance data base as the heart of data exchange. In order to produce this module, the EH&S cooperation has been formed. This cooperation brings together a unique link of chemical expertise and software engineering know-how both contributed by the EH&S partners. With the EH&S substance data module, every company using it can improve business processes and profit from data structure standardization in chemical industry.

## 9 REFERENCES

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## 10 BIOGRAPHY

Born 1956 in Friedberg, Germany. Study of physics at Gießen 1976-81. Master thesis on theoretical nuclear physics. Doctoral thesis 1982-85 at University of Washington, Seattle, and at Max-Planck-Institut für Kernphysik, Heidelberg on theoretical nuclear physics. 1985-86 postdoctoral fellow at Universität Heidelberg. Since 1986 BASF Aktiengesellschaft, Ludwigshafen. 1986-89 projects on artificial intelligence and expert systems. Since 1989 department of emission control and ecology. Projects on large data base applications and software engineering. Since 1993 project head of the **BASIS** project.