



Contract: IPS 2000-00009

**Innovative Evaluation and Design of Industrial
Surface Cleaning Processes**

CLEANTOOL

Project Summary

Extract from the Final Report

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Contents

Summary of the CLEANTOOL-Project from 2001 to 2004

1.1 Goal of the project	4
1.2 Participating companies	4
1.3 Company contacts, questionnaire, documentations of processes and evaluation scheme as project basis	5
1.3.1 <i>Development questionnaire</i>	5
1.3.2 <i>Selection of cleaning processes</i>	5
1.3.3 <i>Approach of enterprises and process documentations</i>	6
1.3.4 <i>Development of evaluation and cost tool</i>	7
1.4 Development of database structure	8
1.5 Development of website, texts, glossary, links and translations	9
1.6 Description of the database	
1.6.1 <i>Information for the user</i>	10
1.6.2 <i>Evaluation</i>	11
1.6.3 <i>Community</i>	13
1.7 Conference	13
1.8 Dissemination, presentations of CLEANTOOL	13
1.9 Communication, Management	14
1.10 Accompanying measures, Clustering	15
1.11 Continuation of work, trademark, future plans, spin-off and TIP	16
1.11.1 <i>Spin off</i>	17
1.11.2 <i>Technical Implementation plan</i>	18

Summary of the CLEANTOOL-Project from 2001 to 2004

1.1 Goal of the project

The CLEANTOOL project was initiated as an aid for small and medium sized enterprises to easily find optimised metal surface cleaning processes. The CLEANTOOL aim was to give SMEs the possibility to save costs (e.g. for cleaning equipment and agents, water or energy) by optimising processes. CLEANTOOL should support them in improving the quality of cleaning and also taking into account environmental and health and safety aspects.

In total 550,000 SMEs operate in the three mainly concerned sectors in the EU 25 "Manufacture of basic metals and fabricated metal products", "Manufacture of machinery and equipment" and "Manufacture of transport equipment", at least one third or 180,000 with critical cleaning tasks. In many other sectors the cleaning of metal surfaces is also crucial, as in the food industry, or very important as in the electrical, optical or plastics sector.

The approach of CLEANTOOL was to present properly evaluated reference processes in a database. These reference processes should not be theoretical or based on e.g. equipment producers' information, but real processes from user enterprises, based on the process data from these enterprises. On completion the database should contain more than 250 best practice descriptions of different cleaning processes. The market of cleaning equipment and cleaners should become more transparent for the user enterprises. Additionally, interactive features should enable the users to find the cleaning process most suitable for their own situation and requirements.

1.2 Participating companies

The first logical step was to find cleaning processes and enterprises willing to share the available data. The project started to look for company contacts.

The basic project assumption was that the SMEs had problems with their cleaning processes and would be willing to co-operate with CLEANTOOL. The interest expressed by the enterprises and associations was more than sufficient. The enterprises looked for more transparent and unbiased information. For the enterprises CLEANTOOL seemed to be an opportunity to find such information in future. Some of the enterprises which supported CLEANTOOL by contributing their experiences were interested in presenting their processes and indirectly their company as a good and innovative enterprise, nonetheless they were still interested in further improving their cleaning methods.

The consortium consisted of partners in five different countries (Germany as coordinator, Spain, Greece, Estonia and Iceland). All partners had to find companies from very different industries in their countries. Finally the CLEANTOOL descriptions covered all important fields of metal surface cleaning applications.

Each partner organisation established an advisory board comprising all metal cleaning stakeholders like applying enterprises, equipment producers, agent producers, authorities, occupational health institutions, researchers and associations.

1.3 Company contacts, questionnaire, documentation of processes and evaluation scheme as project basis

The companies were contacted by phone. If they showed interest the CLEANTOOL partners sent them a letter and basic information about the project goal and approach. The companies had to sign agreements; altogether 100 companies in all partner countries had thus to show their genuine interest in the project. This was the most important project milestone in the beginning.

The most intensive work in the first project periods was firstly the development of the questionnaire as tool to collect all the necessary data from the enterprises, and secondly the development of the evaluation scheme. Although the database was to be developed later on in the scheme, a rough concept was devised; all these documents had to reflect each other as they are strongly correlated.

After starting the cleaning process documentation the questionnaire has been adapted and changed continuously during the project periods. Thus the project partners guaranteed that the views of the applying companies were taken into consideration right from the beginning in all important project aspects.

This provided the foundation for the database.

1.3.1 Development of a common international multilingual questionnaire

The initial questionnaire was drafted by the Coordinator on the basis of experiences during earlier metal cleaning projects (e.g. LIFE-Project MetalVOC: Metal cleaning with fatty acid esters to reduce VOC-emissions). This document played a very important role, because it provided the basic structure for the entire project, as the database, the search features, the evaluation and the cost tool all had to have a common foundation and structure.

The questionnaire was already discussed by all project partners at the CLEANTOOL kick-off workshop. It was further discussed by all advisory boards (representing all stakeholders like applying enterprises, equipment producers, agent producers, authorities, occupational health, researchers and associations).

As the documentation of cleaning processes started, the questionnaire was repeatedly adapted to the practical requirements of the different specific cleaning processes, so that it could describe the wide variety of cleaning methods in an appropriate manner.

Similar repercussions were experienced during the development of the evaluation tool and the database structure. Because of the requirements from this angle the questionnaire also had to be adapted repeatedly.

1.3.2 Selection of cleaning processes

The project partners selected a variety of branches at their kick-off meeting. This list as well as the structure was complemented by the advisory circles, and a matrix of branches, company sizes, throughput of components, manufacturing methods, subsequent processes and different agents/methods was established.

Thus the partners made sure that the all major fields of metal cleaning were covered. Also it was a means for the coordinator to monitor process documentation, as it became visible where processes were still missing. Last not least the matrix was very useful for comparing processes and/or identifying similar comparable processes.

		Cleaning-connected-to-surface-treatment ^α				
		α				
		Phosphating ^α	Painting ^α	Electroplating/Galvanizing ^α	Enamelling ^α	
Companies with highly-automated-cleaning-processes-and-high-throughput ^α	Automobile industry ^α	D47: Car bodies ^α		α	α	
	Suppliers to automobile industry ^α	D40: Vulcanising, gluing of engine mounts ^α		EST-15, 16, 17-18, 19, 20: zinc electroplating [¶] EST-21: nickel-chromium ^α	α	
	other large industry-like- [¶] Manufacturers of machinery ^α	α	α	D66: Turned, punched parts [¶] D74: Pistons screen printed ^α	D106: Bulk cargo ^α	α
		α	α	α	EST-23: nickel-chromium, EST-24: zinc, EST-25 ^α D-63: Sanitary armature parts ^α	α
	Electrics, -electronics ^α	α	α	α	D60: Switches, fuses [¶] D69: Electric and pneumatic controls ^α D68: Receivers ^α D100: Bulk cargo ^α	α
	Aeroplane industry ^α	α	α	D30: Degreasing of e.g. antenna systems (1/d, 70%) ^α	D30: Degreasing of e.g. antenna systems (1/d, 70%) ^α	α
	Manufacturers of printing machines ^α	D21: scanner rollers (300.000, almost 100%) ^α		α	α	
	Manufacturers of fork lifts ^α	α	α	α	α	
	Manufacturers of household appliances ^α	SP-3: Letter boxes [¶] SP-6, 38: Sheets for refrigerators, SP-23: Evaporators for fridges, [¶] SP40: Water heaters, SP43: Washing machines ^α		α	SP37: Oven sheets [¶] SP50: Oven interiors ^α	
	Producers of steels ^α	D67, 68: Filters cleaned with esters ^α	ICE-8: Fans, Teflon, blasting ^α	α	α	
	Agricultural machinery ^α	α	α	α	α	
Medical industry ^α	α	α	EST-7: gas balloons (tanks?); ^α D62: Components for x-ray tubes ^α	D61: Components for pressure transfer ^α D66: Tubes, instruments ^α D62: Components for x-ray tubes ^α	α	
	Food industry ^α	α	α	α	α	
Companies with semi-automated-	Large industry-like- [¶] Shipyards ^α	α	D9: Blasting of ship's hull using CO ₂ ice pellets (300 m2 in ca. 8 h) [¶] SP16: Copper slag blasting ^α	α	α	
	Power supply ^α	α	α	α	α	

Detail of the matrix, indicating processes from the different partner countries (e.g. EST=Estonia) and different cleaning methods by means of different colours.

In addition to this guidance from the advisory boards, technical magazines and books were scrutinized regularly for new or interesting methods. Discussions with other innovation and research projects in similar fields were conducted in order to incorporate the newly acquired knowledge and to avoid duplication.

1.3.3 Approach of enterprises and process documentation

Enterprises were approached in order to document their cleaning processes for the database. Contacts from earlier projects, hints from advisors and from technical magazines were used.

It turned out that the vast majority of enterprises was ready to disclose their processes in detail, because they were especially proud of advances in health and safety protection issues and environmental impact reductions and they hoped for a knowledge exchange to further improve their processes. Only a small minority did not want to give their process details to CLEANTOOL, because they felt they had an important leading edge regarding their competitors. (This was especially the case in high quality cleaning, e.g. for nitriding).

The project staff visited the companies and compiled the documentation with the help of the questionnaire. Compiling the documentation lasted between one and two hours. Answers were usually provided by health and safety or environmental management personnel, for some details master fitter or technicians were consulted. Questions concerning the amount of removed dirt and costs were only answered by a small minority of enterprises, because these data were not available in detailed form. When companies permitted, photos or videos were taken. All project partners used the same hard- and software to avoid compatibility problems.

Following the suggestion of a German advisory board member at a later stage, processes were also documented on the site of equipment producers. This had the advantage that process data were available more easily and sometimes more precisely than in applying enterprises. The workshop practitioners were later approached for their evaluation of the process and to confirm the data. Another advantage was that usually two or three processes could be documented at a time. The equipment producers were ready to supply new and interesting processes even at a later stage, which will assist in keeping CLEANTOOL up to date.

During the whole project the consortium continued to identify new companies and compile process documentation in order to cover the whole wide-spread cleaning market and to present innovative methods.

1.3.4 Development of the evaluation and cost tool

As the target was to find best practice processes, all processes were evaluated regarding various aspects in technology, quality, environment, health and safety at the workplace and regarding the costs. The processes were evaluated jointly by the advisory circles and partners using the evaluation scheme.

The development of the evaluation tool started at a very early stage of the project and this turned out to be very helpful, as such a tool was without precedent and at the same time depended greatly on the documentation of processes being able to cover all the vast varieties of different cleaning procedures.

The partners' awareness of the complexity in evaluating metal cleaning applications grew along with the documentation of processes. This complexity appears threefold:

- § Technical variability of cleaning processes:
variety of existing methodologies in terms of metal cleaning, cleaning agents that can be applied, cleaning quality required, shape, substrate and geometry of the part to be cleaned, dirt to be removed, etc.
- § The variety of criteria considered by the user when selecting the cleaning process: making a decision on what cleaning process is the best for a concrete application implies weighing technological, quality, environmental, health and safety and economic criteria.
- § Users from different industries and regions are subject to different standards, regulations and cost schemes, which gives rise to the application of different weights to these abovementioned criteria. Such weights are not evident at all.

For this reason, from the early stage of the project it was evident that disaggregated but structured indicators for evaluation would be the best strategy to fulfil the users' needs. In this way, the CLEANTOOL evaluation tool was designed using a multi-criterion and user-view based approach.

The tool was tested in practice by applying it to some fairly simple cleaning processes. All partners selected processes, applied the tool and presented their findings, which led to further adaptations. At the last stage the tool was presented at the CLEANTOOL conference, where the international experts basically agreed on it but suggested some minor changes.

Evaluation of costs presented an especially complicated problem. Comparison of costs only makes sense if all individual requirements of the user are met. For example, the CLEANTOOL database contains two cleaning processes that apply the same cleaning method, however the type of dirt or the subsequent process (quality of cleaning required) can be very different. One of them might be much cheaper than the other one, but if, for instance, the quality of cleaning achieved by this cheaper application is inferior to that achieved by the other process, economic comparison makes no sense, as the technical requirements for the cleaning process are not met.

On the other hand, cost factors vary widely between countries and even between regions in the same country. Ranking the costs as such would give rise to bad scores for processes documented in Germany or Iceland, because, for example, labour costs in these countries are higher than in Estonia or Spain.

In order to overcome such problems, CLEANTOOL partners agreed to describe as detailed as possible the cost factors which have to be taken into account when accurately calculating process costs. Cleaning processes are activities usually considered as secondary ones whose cost structure in traditional systems is hardly transparent.

However, as labour costs and costs related to the enforcement of new environmental and health and safety regulation have increased, attention paid to the cost factors of these “minor” processes is a growing source of competitiveness. When available, data on such cost factors for documented processes were presented. On the same cost page a column for the introduction of user’s costs per unit was provided, allowing the user to interact with the cost tool and to customize process costs recalculating them according to actual prices to be paid by the CLEANTOOL user.

1.4 Development of database structure

The development of the database can be seen as the other major task of the project.

A suitable structure had to be developed for the appropriate storage of the data and which allowed the users to obtain their required information. After an unfortunate experience with a wrongly qualified developer, suitable partners were found for the database and the related web surface development.

The development took place mainly during the 4th and 5th project period. In the final period, during the input, translation and testing phases, smaller changes and additions were made and bugs were eliminated. The collaboration between the coordinator, partners and the database developer was very intensive and required a lot of development work from all stakeholders.

IPS 2000/00009 CLEANTOOL, PROJECT SUMMARY

D 112 Laser cleaning of brake linings before powder coating (in-line) (Date: 2004-06-16) (Company: Automobile supplier)

Brake pads made of steel are cleaned from oxides and minute organic residue automatically in the production line by a solid-state laser; thereafter painting or powder coating

Material Dirt Equipment Agents Process Costs Evaluate Compare selected processes

Material:	Brake pads
METAL / NON METAL :	steel
Shape :	smooth surfaces, a simple geometry
Utilisation of equipment (throughput, workload) in % :	95
Maximum possible throughput of parts per year :	No statement
Max. area which can be cleaned per year :	47.520 m ²
Dirt:	oxides, minute organic residues
Previous process :	Heat treatment to stabilize linings
Agents:	Cleaningstep:1 No cleaner [Medium:No agent]
Equipment:	CL 120 Q
	Solid-state laser (120 W) with a glass fibre feed for the manually operated optical tool; can also be fixed in automatic machines (also in 500 W available)
Process:	Multitask equipment, decentral cleaning station (integrated in production line), Automated system, Laser cleaning
	Cleaning with a solid-state laser optic supplemented by mirrors, fixed in an automat with continuous passing through of parts, no agents
Duration of cleaning process for one part (min.) :	0.08
Duration of cleaning process for the charge (min.) :	No statement

Database output via “Technical Sheet” showing the process overview. The line of links in the upper part gives access to almost all collected data and to the cost and evaluation tools

During the documentation of the cleaning processes, all staff was already asked about their requirements concerning the database. Their demands were mirrored in the search tool and in the display of the process data.

The input tool and the structure of the stored data were constructed in a very flexible way and so as to allow the introduction of new terms on almost all levels. Thus it is possible for each project partner to adapt the database to new types of cleaning processes, new agents, new steps, etc. previously not recorded. It was one of the major challenges in CLEANTOOL to adopt the database structure continuously to the growing of the experience from practical process documentations.

1.5 Development of website, texts, glossary, links and translations

As important additional information the consortium developed background texts (on legal and different cleaning aspects, producers and suppliers) and a cleaning glossary . All this information was not only important with regard to the future users but also as a basis for the common understanding in the project team.

The necessity of a glossary became clear at a very early stage of the project, as partners from different countries had to be sure they talk about the same items. Several web-based glossaries were identified and used as a foundation for the CLEANTOOL glossary. The co-ordinator asked other projects (SAGE an internet

database from the US EPA, TURI the Toxics Use Reduction Institution at the University of Massachusetts in Lowell, a cleaning project from the University of Jena and Bauteilreinigung [“component cleaning”] from the University of Dortmund) to be allowed to make use of their published definitions and glossaries and is very grateful to all of them for their consent. Special care was taken to differentiate between US American and British terms and definitions. Where applicable, British terms were always used. All partners contributed to the glossary. Responsibility for the update and the necessary coordination was assumed by the Spanish partner, who laid down the procedure in a special paper. The glossary proved to be an important tool for the translations, as all partners were sure they referred to the same definition.

A search assistant was developed to improve user friendliness. All this information was translated into all partner languages and French. Actually the data input demanded not only a very accurate transfer of the data from the questionnaires but also an internal quality (double) check by the national teams.

Project partners decided to concentrate on the web based database and put less emphasis on the CD version. This was due to the fact that more and more companies all over Europe have Internet access and this would allow easier and faster update of CLEANTOOL and allow all users to refer to the latest version.

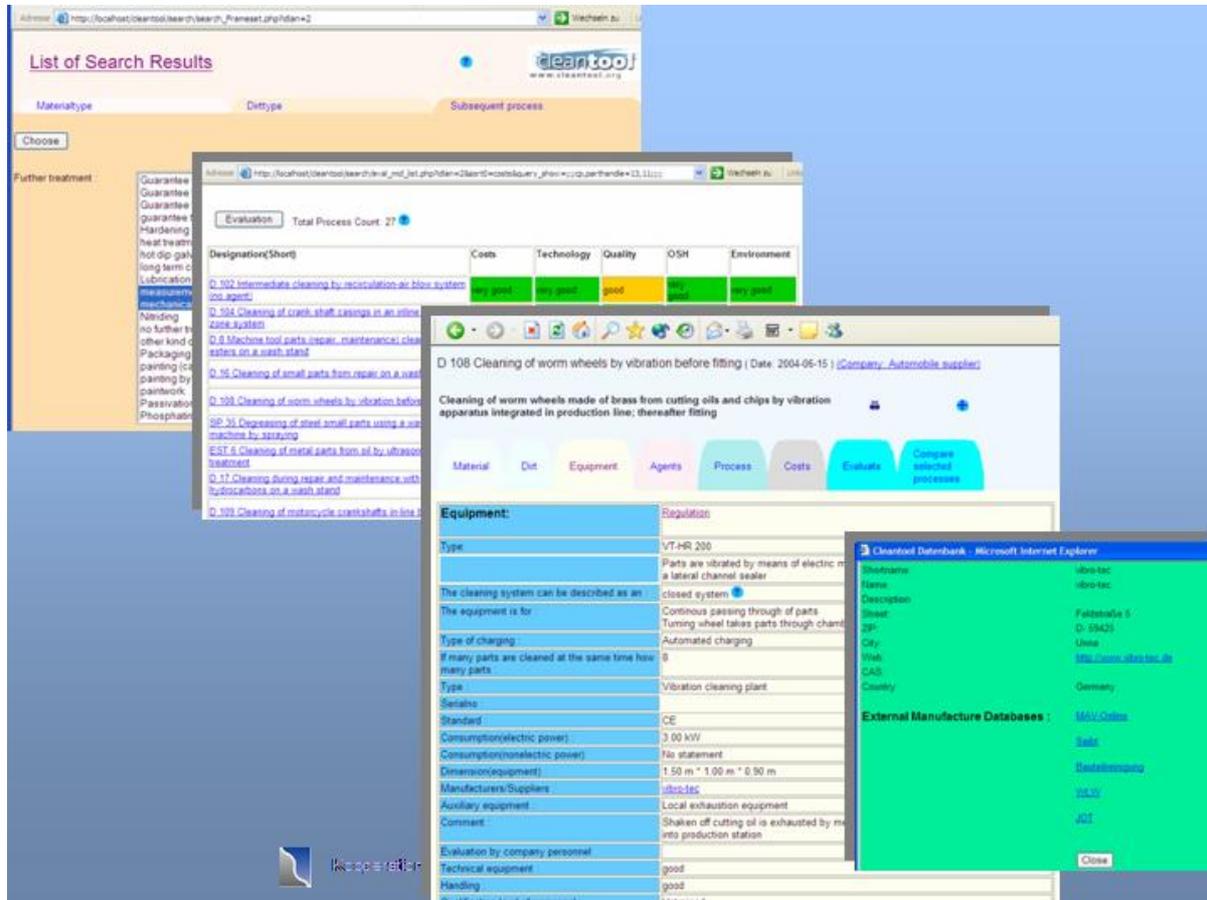
CLEANTOOL is, in its final stage, more than just a database of reference processes. It was developed further to an information platform, describing cleaning methods, agents, substrates etc. and offering a wide technical multilingual glossary on metal cleaning as well as links to websites on legislation, regulations and prevention as well as to magazines, and also to contact persons for further inquiries. Thus it is not only of value to the workshop practitioners but also to students, salesmen and translators. It has a big potential to become a major information exchange tool between all those interested in metal cleaning.

1.6 Description of the database

1.6.1 Information for the user

There are two possibilities for accessing the datasets: Firstly, users find basic information on different cleaning methods and can view all related processes stored in the database. Secondly, users enter all individual requirements via a comprehensive search interface. This may include parameters for material, dirt, size, geometry, amount and subsequent processes. The search results will appear in a list alongside a rough basic evaluation. From this list the interesting processes can be selected and the respective technical sheet with almost all stored data can be retrieved.

This information is displayed on additional screens and includes e.g. removed dirt, all process steps and the agents used in these steps, the type of equipment and the cleaning procedure in detail.



1.6.2 Evaluation

Search results can be evaluated by the system according to the individual requirements, be they *technological, quality, environmental, health and safety or cost* considerations.

In this way all criteria will be further subdivided, in order to avoid coming up with a total score, which will mean little to the practitioner. The users are to decide how to weigh the different categories according to their individual requirements. This tool provides evaluations on a scale of one to five and has the following structure:

Technology

In this area users can see how the company technician evaluates the equipment. CLEANTOOL highlights the factual statement of a practitioner instead of plant producers or scientists. In addition important selection criteria are given such as: maximum equipment utilization, size of equipment, cleaning steps, auxiliary equipment and necessary qualification level of operator.

Quality

Under the heading quality – defined as customer satisfaction - users are presented with the following criteria: quality of the process as seen by the plant technician, description of the subsequent process as a scale for the required cleanliness, description of the applied internal and/or external standards and a description of the analytical methods applied.

Occupational Health and Safety

Health and safety criteria are broken down into the areas agent, equipment and the combination of agent and equipment with their special hazards.

a) Cleaning agent

The users receive all ingredients plus their percentages listed, to the extent to which they had been ascertained, together with the related danger symbols, R- and S-phrases and the occupational exposure limits.

In addition an evaluation based on the column model¹ will be displayed. According to the R-phrases and other criteria specified by the model an evaluation for the following subcriteria is given: acute health hazards, chronic health hazards and fire and explosion hazards.

The working concentration in the plant thereby serves as basis for the establishment of the R-phrases and other criteria. This is important regarding aqueous cleaners, where concentrations of the delivered product may vary considerably. This would distort a comparison of different agents and their properties during the cleaning process.

b) Equipment

Here users are informed as to whether the equipment meets the related standards and the CE directive and thus a risk assessment and a subsequent optimisation has been applied.

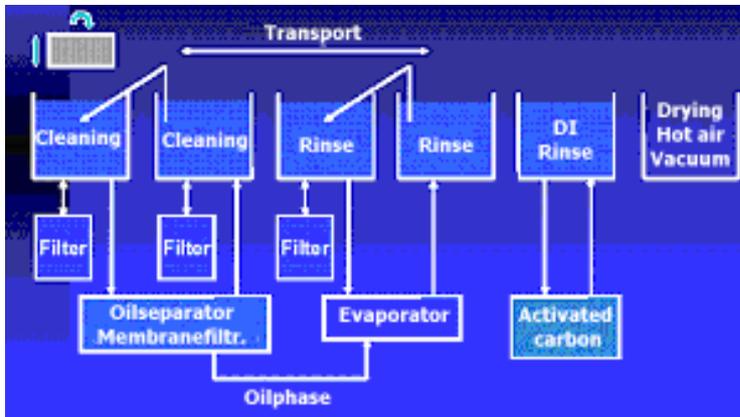


Diagram: Sophisticated advanced aqueous cleaning

c) Combination agent/equipment

In this area, too, the column model has been applied. However the criteria under the heading "Hazards caused by procedures" have been largely supplemented. A matrix was developed, which considers all major aspects like degree of plant confinement, size and type of exhaust, volatility and temperature of agents plus the hazards caused by the agents.

Environment

Environmental hazards caused by the agents are also evaluated by using the column model, considering the R-phrases, the danger symbol N and the German water pollution classes. Hazards caused by the exposure potential also follow the column model. Here state of aggregation and vapour pressure are used for the evaluation. Finally the disposal methods are stated, but only for the cleaner. The dirt is not considered in order not to devalue a good process because of a difficult type of dirt, as this cannot be blamed on the process. As in the area of occupational health and safety all evaluations are based on the working concentration as used in the plant.

¹ The column model is part of the German TRGS 440 and provides a ranking related to e.g. R-phrases (Download under: www.hvbg.de/d/bia/pr/modell/spaltee.htm; an electronic version can be found under <http://www.aser.uni-wuppertal.de/>)

More equipment related are then the statements on energy and water consumption as well as the generated amount of sewage.

Costs

Evaluation of costs for cleaning processes poses a special challenge. Even within one country the prices for energy, water, agents etc. may vary, not to mention variations between different countries. To overcome these problems, CLEANTOOL provides an interactive feature, encouraging users to enter their individual costs for labour, energy, water etc. into the calculation interface and get back a customized estimation of cleaning costs.

Users may view single processes or they may compare different selected processes appropriate to their individual demands. In the first case they get the specific energy and water consumption as well as the amount of sewage plus the annual costs. In the second case the parameters are related to the removed dirt, in order to have a common gauge for the comparison. The values are then presented on the background of a scale based on all stored data.

1.6.3 Community

Considering the vast amount of different cleaning requirements, the CLEANTOOL database will not be able to answer all questions satisfactorily. Also for this reason the web presentation was carefully developed. It will provide a fast means for all questions in the field of metal cleaning, e.g. by displaying optimisation potentials, developed by previous projects, by giving access to various magazines, specialists and practitioners, links to other databases, etc.

1.7 Conference

The international conference was regarded as successful by all advisory board members in that all major aspects of CLEANTOOL were discussed and the country differences and developments were presented to the international panel of cleaning specialists.

This panel also approved in general the CLEANTOOL database and evaluation instruments and made helpful suggestions which were incorporated into the further development of the database.

The conference failed to attract the number of workshop practitioners from Germany that had been expected. This was due to the fact that no simultaneous translation from English was offered. Even engineers and technicians from "global players" felt they could not follow detailed discussions on specialised cleaning issues in English.

1.8 Dissemination, presentations of CLEANTOOL

There were two important groups, which had to be reached: the users in the companies and the cleaning specialists in order to get publicity and to find possibilities for further funding and development of the database. Several articles were published in professional and in user journals, there were some radio and TV interviews, several local and regional workshops were held, the partners attended fairs and other events. A vast amount of information and dissemination material was

published on paper and on the Internet. Also supporting slide shows and flyers/brochures were developed by all partners.

The national advisory boards have been of great help regarding dissemination activities as all members propagate the database actively in their respective groups, which encompass all levels interested in metal cleaning.

The Spanish partners conducted a special workshop to identify the best methods of dissemination and managed to have all important stakeholders participate. As a result of this meeting, target groups and material geared to each of them were identified. Thus, target groups for the CLEANTOOL database were extended so that they included not only workshop practitioners and production technicians but also university and professional training students, trade unions and insurance firms.

Dissemination material such as thematic brochures and leaflets (for example for costs and H&S evaluation methodology), a fact sheet with the description of the database contents, a poster with labelling details for hazardous chemicals (danger categories, R-phrase and S-phrase descriptions) and a folder were designed to be delivered in paper form to support participants of CLEANTOOL workshops, conferences, meetings, etc. Also, the need for designing posters to illustrate presentations became evident.

One of the side effects of the material delivered, particularly the H&S methodology leaflet and the cost brochure, has been its use in enterprises not only to assess the performance of cleaning processes but also of other production processes.

All participating enterprises and a large number of SMEs had been contacted in writing in order to draw their attention to the database and hopefully make them test the database and give feedback.

Here are some figures showing how many visitors to the website and to the database have been recorded by the provider:

	Website	Database
Week 30.08.04 to 05.09.04:	3182	1595
Week 06.09.04 to 12.09.04:	4380	1625
Week 13.09.04 to 19.09.04:	3274	1780
Week 20.09.04 to 26.09.04:	1726	1796
Week 27.09.04 to 03.10.04:	1885	1519

This comes roughly to 600 per day, which is a very reasonable figure and shows that CLEANTOOL has really aroused interest. From a period during which users had to register before they could use the database, we also know that about 80% are workshop practitioners looking for cleaning solutions or better processes than currently applied. This is also a very encouraging development showing that CLEANTOOL is indeed reaching its target group.

1.9 Communication, Management

To fuse the proposals and recommendations from all partners and different advisory boards regarding data, questionnaire, evaluation scheme and database into one coherent concept, was a major part of the project work. This provided a solid basis and guaranteed that all different approaches and views of the partners were taken into account. Most helpful were the project meetings which were held twice a year and the ftp platform for document exchange.

Communication and management were highly sensitive matters as five project partners from five European countries plus advisory boards in all countries with all different stakeholders and experts in metal cleaning with their differing objectives had to work on one common task.

This was guaranteed mainly by email circulars but also through regular meetings (partners twice per year, advisory boards similar) and through working groups on special issues. This turned out to be a very recommendable instrument as these groups allowed a much faster transfer of knowledge between the partners as compared to emails, letters and phone calls.

At a later stage also a FTP platform was established so that important documents would be available constantly to all partners (especially in case of large files, which may not be accepted by all email providers, FTP provides a good alternative). The coordinator took pains to encourage suggestions from and review by all parties concerned, to distribute all statements and to consider any useful hints.

The coordinator and the partners were also very interested in approaching similar, earlier or parallel projects in order to have their findings incorporated and to avoid duplication (see paragraph 1.5).

Working groups on special issues turned out to be a very recommendable instrument as these groups allowed for a much faster transfer of knowledge among partners as compared to emails, letters and phone calls. Doing things together also gave lots of input because many things were questioned, which earlier on were taken for granted.

1.10 Accompanying Measures, Clustering

The CLEANTOOL project was part of the DG Enterprise "Innovation" Programme which had a set of horizontal projects called Accompanying Measures. The aim of the Accompanying Measures was to give support to the projects in diverse aspects of management and concept of innovation: sustainable development, marketing, project management, knowledge management, etc.

Efficiency was improved by clustering innovation projects. This clustering process was initially approached by grouping innovation projects with similar needs so that they could help themselves and get joint support from AMs. In this way, AMs could identify the most relevant areas for action and prevent repetition of the same work for several individual projects. During the period of development of CLEANTOOL this idea of clustering was proposed, discussed, tested, and implemented following a dynamics of learning by doing through several meetings in Pamplona, Luxemburg, Potsdam, Florence, etc.

The configuration of clusters has varied from the original idea, i.e. grouping the projects according to the main field of research into innovation projects, to grouping according to the main fields of needs expressed by innovation projects, in a way that allowed the same project to participate in several clusters depending on both the specific needs of IP partners and the stage of execution of the IP. CLEANTOOL has actively participated especially through the Spanish partner in this process of clustering.

The balance of participation in such a process is positive because this transnational clustering contributed to strengthening bonds with local institutions participating in other IPs and to developing collaborative initiatives with them and their partners. An example is the bi-directional collaboration established between the Spanish partners of CLEANTOOL and ENVIREDOX during the development of both projects: participation of Enviredox's partner in the Advisory Circle of CLEANTOOL, participation of CLEANTOOL's partner in the Participation Forum of Enviredox, the setting of a shared strategy of dissemination activities regarding project results for national and international events, as well as development of proposals for new projects.

Also, clustering was useful for acquiring better knowledge about the other innovation projects under development and of potential partners for future projects. A main shortcoming of this process of clustering has been the lack of specific funding and time in the initial project budget and work plan for carrying out cluster activities. Also, the experimental character of the clustering process reduced its effectiveness, so the framework varied from meeting to meeting. However this phase of experimentation and correction has proven to be necessary in order to tune the idea to its application, and the participation in drawing up and implementing this concept has been very interesting.

1.11 Continuation of work: trademark, future plans, spin-off and TIP

The co-coordinator applied for trademark rights for CLEANTOOL (for the project name and the logo). This was granted by the concerned EU authority (Office for Harmonisation in the Internal Market - OHIM). It allows the use of ® for a registered trademark. An accompanying agreement between the project partners was drawn up and signed.

Planning for the time after the project end started as early as 2002. The project partners gathered the different possibilities for the continuation of the database, discussed them with various experts and studied them in detail.

Sell the whole product

That would mean selling the database to e.g. a publisher and also give away all database rights and the trademark. This possibility is very unlikely, but should be tried, if nobody in the CLEANTOOL consortium would be interested to continue. It could be possible to sell a licence to large companies, eg. from the automobile sector, so they could use CLEANTOOL to structure their internal procedures and /or their supply chain.

Charge users of the database

In this case the following aspects should be taken into account:

- only large companies can pay for the data, however the main users are SMEs
- perhaps companies are not interested for long periods (they buy new cleaning equipment every 10 years)
- the fee could be reduced (or the use could even be free of charge) for companies participating, that means companies which allow documentation of their processes. An interesting system is applied by some database providers (e.g. "xipolis"): Basics are free of charge and fees increase with importance of information.

Find sponsors for the database

Sponsors could be: Associations, federal institutes or authorities, producers of equipment and agents, companies.

The advantages to the sponsors could be:

- improvements in technology, OSH, environment
- faster distribution of advanced methods
- advertisement
- producer lists
- registration of users / forwarding the data to the companies for the purpose of advertising / sending newsletters etc.

The main idea is that sponsoring could be done by institutions from different areas of metal surface cleaning to support the enlargement of the database in that special direction.

Motivate users to take part in maintaining and updating the database.

This was not seen as a realistic possibility in the near future but there might be an opportunity if CLEANTOOL is further developed into a comprehensive benchmarking tool as then users need to enter a lot of data about their cleaning processes.

All possibilities are followed up but sponsoring was seen as the best solution, however convincing sponsors needs a broader dissemination and a larger set of processes. experience. The project partners agreed that subsequent projects should be set up, so that the database can be updated regularly and thus remain attractive to users and can become more popular.

It is also noteworthy that CLEANTOOL provides best practice examples, which could be used for BREFs ("Best Available Techniques Reference Documents", an instrument to implement the IPPC Directive, Integrated Pollution Prevention and Control, Council Directive 96/61/EC of 24 September 1996). These BREFs are very difficult to establish in the field of metal cleaning due to its highly complicated and diverse structure and application. Maybe CLEANTOOL could serve as a model for similarly difficult BREFs.

It should also be noted that metal cleaning processes are of a horizontal nature (similar process principles, sometimes even equipments are used in different industries).

A general description and evaluation of the methodology (spin-off) was worked out as well as a plan for technical implementation and for the continuation of the work.

1.11.1 Spin off

The whole procedure developed by the CLEANTOOL project partners can be recommended for all similar set-ups of databases, which are to display difficult, complicated and complex tasks involving many stakeholders with differing objectives.

It is above all important to see that all different stakeholders and experts in this field become involved in the project. This can only be achieved if the basic project concept is convincing (i.e. the stakeholders should best be involved as early as the development stage of the concept). And this will also guarantee that the practitioners will use the developed database and that regular updates can be organized. The different expert groups (applying companies, plant manufacturers, agent manufacturers, surface technology enterprise associations, research, occupational health organisations, environmental authorities) were represented on a project advisory board.

All project partners had their special fields of expertise (innovation, environment, technology, economics, health and safety). Communication and management are highly sensitive matters as usually many project partners from various European countries plus their advisory boards with all different stakeholders and experts with their differing objectives have to co-operate on a common task, a task which is usually not defined in detail at the beginning of the project but has to be developed as the project advances. It is of major importance that all parties concerned are always involved at all stages of all major project tasks.

1.11.2 Technical Implementation Plan

The basic practical products which are suitable for implementation and further exploitation are:

- The documentation of 260 best practice cleaning processes in companies in seven languages
- Videos, photos, graphics from cleaning processes
- The Registered Trademark CLEANTOOL®
- The software of the CLEANTOOL database
- The assessment methodology
- The cost tool
- The CLEANTOOL® web pages with comprehensive information on metal cleaning, including networks and contact persons

All these results are owned by the consortium until the end of the project. Later on the co-ordinator Kooperationsstelle Hamburg will be the owner of the products in the form they have at the end of the project, and of the trademark.

The CLEANTOOL partners assume that the database will contribute to the improvement of more than 1,000 cleaning processes in the next two years after the end of the project. Already at the end of the project 300 users of the database were registered.

The database will also contribute to an international European knowledge exchange; a comparison of cleaning processes in different countries is possible.

It will contribute to better compliance with European legislation, especially in the areas of environment and health and safety.

Further exploitation opportunities are seen in the following areas:

- Use of the methodology for similar databases, especially for coating of metal surfaces.
- Introduction of a sophisticated comprehensive benchmarking tool.
- Partial reimbursement of the costs by charging fees for search opportunities or results.