CLEANTOOL Evaluation Tool (User Assistance)

The lines marked blue have to be calculated manually and then entered into our database input tool. All other categories will be automatically provided by the system.

This evaluation tool is supposed to be integrated into the database to allow the user after having received a number of processes as search result to find the most suitable process according to his/her requirements (water consumption, energy consumption, health hazards, environmental hazards, size of equipment, training needs for staff, etc.).

In general evaluations will be done in five grades, whereby 1 is bad, 2 …3….4….5 is very good/excellent.

Technology

These criteria do not provide an actual evaluation but rather process selection criteria for the user.

1	Utilization of equipment	Calculated from questionnaire (Quest. 3.5 I)	In percent
2	Throughput	Calculated from questionnaire (Quest. 3.5 I)	In number of parts
3	Maximum possible throughput	Calculated from questionnaire (Quest. 3.5 J)	In number of parts
4	Floor area for equipment, size of equipment	Length or depth, width, height (Quest. 3.7)	In meters
5	Central (separated from production line) or integrated or clean-in-place	(Quest. 3.9)	Central/ integrated/ CIP
6	Number and/or description of steps	Number/description (Quest. 3.8 A)	Number/ description
7	Special equipment or multitask equipment	Special/multitask (Quest. 3.9)	Special/multitask
8	Waste/-water treatment and auxiliary equipment	As in questionnaire (Quest. 3.12)	Text
9	Qualification level needed for equipment, agent, process	As in questionnaire (Quest. 6.4)	Text
10	Quality of equipment as seen by plant technician	new question: under 3.7 –last line (also in 7.2)	Five grades

Quality (Customer Satisfaction)

1	Quality evaluation (free text)	By statement of users with explanations to assigned grades (Q. 6.1)	Free text not graded with explanations
2	Quality evaluation (graded)	Five grades (Q. 6.1)	Five grades
3	Subsequent process	Q. 3.8 B	Text
4	Standards	Which Standards are applied (Q. 6.2 and 3.8 C)	Text
5	Analyses	Which analytical methods are applied (Q. 6.3)	Text

Concerning item 1 and 2, some German AC members felt, a problem could be the evaluation of changes in colour/spots or other changes on the material, which are only an optical problem, but do not pose a technical problem. This may be still a decision criterion. This should be taken into account under the “Evaluation of the company” and perhaps added into the categories 1-5. Perhaps also the rejects rate could be gathered and the reasons mentioned. The numbers 1-5 can not be used without some explanations, because nobody would decide for a “bad” quality. But it

would be possible to explain that the number depends on the process and e.g. optical changes perhaps do not play any role in other processes. (Hint for the interviewer has been added.)

OSH:

List of contents

A list of contents, giving the ingredients of the cleaners with R-phrases etc. will be provided for each agent, so that users can check as to whether there are any hazardous ingredients which may not affect the following evaluation because they might be in very low concentration. (Database should give a hint, that we may not able to list all ingredients completely.)

Agents

1	Acute health hazards	Column model, mainly R-phrases (Q. 4.3)	Five grades
2	Chronic health hazards	Column model, mainly R-phrases (Q. 4.3)	Five grades
3	Fire and explosion hazards	Column model, mainly R-phrases (Q. 4.3)	Five grades

According to the R-phrases an evaluation ranking from 1 to 5 (Risks: very high, high, medium, low, negligible) is given out.
Research in case of not or not comprehensively indicated R-phrases may be necessary: e.g. in Danish tables (QSAR-tables; Quantitative Structure-Activity Relationship).and/or HSDB (http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB), Global Information network on chemicals (http://www.nihs.go.jp/GINC/index.html), Chemical safety information (www.inchem.org), etc.
Concerning data gaps refer also to column model page 6!

Concentrations:
We will rely on SDS especially compiled for the working concentration (agent producers have to surrender SDSs also for the concentration applied in the workshops). We will use these special SDSs to get the information for the column model (R-phrases, ...) etc. (If we would use the SDS with the original concentration of the agent, an agent producer who dilutes his hazardous product with a sufficient amount of water would score good results and another one with the same product who does not dilute that much would get bad results; although the working concentration could be the same.)
Concerning the questionnaire this would require, that we fill out the agent particulars for the working concentration, but also list all ingredients with their phrases, symbols, OELs and percentage. (The questionnaire has been altered accordingly)
For those cases, where we are not able to obtain the said SDS, we will provide a guide, how to do the necessary calculations by oneself. (Also the German partner may b asked for support.

S-phrases are not considered necessary for the evaluation as they mirror the R-phrases by transforming them into safety recommendations (Example: R – harmful to eyes, S – protect eyes), but they will be presented to the user, in order to explain what safety measures should be implemented.

The needed amounts of agents and thinners/diluents will be considered via costs.

Observance of OELs through equipment and auxiliary techniques should be presumed.

Equipment

1	Mechanical, electrical, thermal, fire, explosion, … hazards	prEN 12921, EN 1248 blasting equipment, EN 1829 jet cleaners (Quest. 3.7)	Met/not met
2	Noise	CE label (Quest. 3.7)	Met/not met
3	Hazards caused by procedures	Adapted column model: open or closed equipment (Quest. 3.11 B); see below	Split evaluation, see table below

Pr EN 12921 1-4 deals with metal cleaning plants using aqueous (2), flammable (3) or halogenated agents (4), describing all specific hazards involved and providing a list of related requirements which have to be met by plant produces. According to the German AC, all major plant producers conform to these standards.
Similar information for blasting equipment is provided by the EN 1248, and for “High pressure cleaners – high pressure water jet machines” these requirements re laid down in pEN 1829.

Item 2: noise. Here we want to furnish the user with a statement as to whether the equipment is built to acceptable technical standards concerning noise. The CE directive (93/68/EEC) in general requires from equipment producers to conduct risks assessments concerning all hazards and take preventive steps or minimize risks starting from the source. For bigger machinery like cleaning plants the CE directive refers to the Directive of Machinery (98/37/EC), which in turn states in it’s Annex I:

> 1.5.8. *Noise*
> Machinery must be so designed and constructed that risks resulting from the emission of airborne noise are reduced to the lowest level taking account of technical progress and the availability of means of reducing noise, in particular at source.
> 1.5.9. *Vibration*
> Machinery must be so designed and constructed that risks resulting from vibrations produced by the machinery are reduced to the lowest level, taking account of technical progress and the availability of means of reducing vibration, in particular at source.
> 1.7.4. *Instructions*
> (f) The instructions must give the following information concerning airborne noise emissions by the machinery, either the actual value or a value established on the basis of measurements made on identical machinery:
> - equivalent continuous A-weighted sound pressure level at workstations, where this exceeds 70 dB(A); where this level does not exceed 70 dB(A), this fact must be indicated,
> - peak C-weighted instantaneous sound pressure value at workstations, where this exceeds 63 Pa (130 dB in relation to 20 ìPa),
> - sound power level emitted by the machinery where the equivalent continuous A-weighted sound pressure level at workstations exceeds 85 dB(A).
> In the case of very large machinery, instead of the sound power level, the equivalent continuous sound pressure levels at specified positions around the machinery may be indicated.
> Where the harmonised standards are not applied, sound levels must be measured using the most appropriate method for the machinery.
> The manufacturer must indicate the operating conditions of the machinery during measurement and what methods have been used for the measurement.
> Where the workstation(s) are undefined or cannot be defined, sound pressure levels must be measured at a distance of 1 metre from the surface of the machinery and at a height of 1,60 metres from the floor or access platform. The position and value of the maximum sound pressure must be indicated.
>
> In the parallel FAQs the EU explains further (translation from German by KK):
> These in Annex I item 1.7.4. f demanded values serve as means for the buyer, to allow him considering other features or compulsions for his plant to choose the equipment with the lowest noise level. This is also the reason, that these values have to be stated in the all papers accompanying the machine (Annex I item 1.7.4. letter d).

We are thus convinced that it will be sufficient for our evaluation tool to refer to the CE label.

Item 3: Adapted column model “hazards caused by procedures”, (see Questionnaire 3.11 B and 3.12) Replacement of last column in column model, in order to have a clear evaluation of how easy dangerous substances may be released, or how well they are confined, during the cleaning process (see table next page):

Quest. 3.11 B	Definition	Exhaust etc.	Hazardous substances as defined in column model under acute, chronic, environment, fire&explosion hazards						Eposure potential					Non hazar-dous		Blast. media
			Very high/high		Medium risks		Low risks		Vapour pressure in mbar or hPa							
			RT	>60°	RT	>60°	RT	>60°	>250	250-50	50-10	10-2	2-0.1	RT	>60°	RT
Open system	Manual cleaning Washing stand Open bath Open spray cleaning Open blasting	No exhaust, general exhaustion			1		3	1				1	2	5	2	1
		Local exhaustion equipment			1		4	1			1	2	3	5	3	2
Partly open system	Bath with lid or EPS (expanded Polystyrene) or condensor Blasting in a partly confined chamber	No or general exhaustion			2	1	5	2		1	2	3	4	5	4	3
		Local exhaust, under-lid exhaustion	1	1	3	2	5	3	1	2	3	4	5	5	5	4
Closed system	Washing machine/plant, baths encapsulated, closed degreaser, closed chamber blasting (Exposure possibilities when opening chamber/ encasing, when filling, sharpening, testing)	Exhaust	2	1	4	3	5	4	2	3	4	5	5	5	5	5
		Exhaust and special locks	3	2	5	5	5	5	3	4	5	5	5	5	5	5
Air tight chamber	Airtight chambers with active carbon provisions Airtight “zero emission” chambers	Exhaust and treatment by active carbon	4	4					4	5	5					
		Closed loop (process air volume shift)	5	5					5	5	5					

How to read the table:

1. Check in the first two columns what type of system you are dealing with
2. Check in the following column what type of exhaust is connected to your system
3. Thereafter select the type of substance, the vapour pressure etc. and the temperature in conjunction with the column model
4. The number in the meeting point (figure between 1 and 5) is to be selected for the evaluation scheme (OSH-Equipment No. 3); if different categories qualify, the worst figure is to be selected.

(Grey spaces show either procedures, which should not be applied, e.g. chlorinated solvents in open systems, or procedures, which would have an exaggerated safety level, e.g. neutral aqueous solutions in an airtight chamber.)

Environment:

Agents

1	Environmental hazards	Column model, R-phrases, N symbol, German water pollution classes (Quest. 4.3)	Five grades*)
2	Hazards posed by exposure potential (emissions into air)	Column model, vapour pressure, state of matter: gaseous, aerosols etc. (Quest. 4.3)	Five grades
3	Treatment of waste for agent, only	Evaporation, disposed of, reused/utilised/recycled, reused/utilized/recycled within company, no waste (Q. 4.9.1)	Five grades

According to the R-phrases and the vapour pressure etc. an evaluation ranking from 1 to 5 (Risks: very high, high, medium, low, negligible) is given out.

*) In this case “very high” and “high” risks are combined; agents qualifying for this category are assigned the worst score i.e. “bad”. The “sufficient” category is skipped.

In case of waste key codes a different attribution in different countries or even in different provinces, counties, Länder, etc. is possible. Partners should gather typical key codes and compare these.

It has turned out that almost all waste from metal cleaning is listed as hazardous, therefore we will not consider this issue in our evaluation tool.

Concerning the treatment of waste we will only evaluate the agent, as the dirt cannot be attributed to the cleaning process:

Evaporation (1),
disposed of (2),
reused/utilised/recycled – including utilized heat generation (3),
reused/utilized/recycled within company (4),
no waste (5)

The other waste will be described only but not evaluated.

Equipment

1	Electric energy consumption	(Quest. 3.7, 3.5 and 8.2)	kWh
2	Other energy consumption	(Quest. 3.7, 3.5 and 8.2)	kWh
3	Water consumption	(Quest. 3.7, 3.5 and 8.2)	m^3
4	Waste water	(Quest. 4.9.3)	m^3

Here only the figures will be displayed but no evaluation grades given. It will be left to the user to compare e.g. the water consumption in different processes.

Concentrations:
We will rely on SDS especially compiled for the working concentration (agent producers have to surrender SDSs also for the concentration applied in the workshops). We will use these special SDSs to get the information for the column model (R-phrases, ...) etc. (If we would use the SDS with the original concentration of the agent, an agent producer who dilutes his hazardous product with a sufficient amount of water would score good results and another one with the same product who does not dilute that much would get bad results; although the working concentration could be the same.)
Concerning the questionnaire this would require, that we fill out the agent particulars for the working concentration, but also list all ingredients with their phrases, symbols, OELs and percentage. (The questionnaire has been altered accordingly)
For those cases, where we are not able to obtain the said SDS, we will provide a guide, how to do the necessary calculations by oneself.

The needed amounts of agents, thinners/diluents and the produced amounts of waste will be considered via costs.

Observance of OELs through equipment and auxiliary techniques should be presumed.

Costs:

Total cost (usually per year)
Total cost per unit (referred to amount of dirt or number of parts, or sq. meters of surface)

Investment costs (equipment ec.)
Operational costs
Labour
Energy
Water/wastewater (treatment)
Waste management
Maintenance
Agents

Here only the figures will be displayed but no evaluation grades given. It will be left to the user to compare e.g. the water consumption in different processes.

Intensity indicators (see Graciela's paper)

A background text should be included explaining e.g. which data are estimations and the different prices for energy, water etc. in the different countries. The German AC suggested to use data from statistical offices and/or from university of Jena.
For more detailed results the user input level can be used (interactive tool).
The utilisation of the equipment has to be taken into account; statement on the web page.
(If possible, a comparison could show the higher costs per charge if utilisation is low.)

Rough evaluation accompanying the listed datasets in the database:

Technology:
We take the evaluation of the company concerning the equipment as rough overall evaluation.

Quality:
We take the evaluation of the company concerning the quality as rough overall evaluation.

OSH:
We take the hazards caused by procedures as rough overall evaluation.

Environment:
We take the environmental hazards as rough overall evaluation.

Costs:
We are still discussing the whole concept of cost evaluation with Hans and Andreas. Meanwhile I would suggest that we take the evaluation of the company concerning the costs as rough overall evaluation.

Guide on adaptation of SDS according to working concentration (aqueous agents)

In any case we should ask the supplier to give us the required data (see example letter), if they don't comply we should use our own calculations as below. You may also look for assistance from the German partners.

1. Change of danger symbols and R-phrases

I. Select dangerous substances from SDS accompanying the cleaning agent in its delivered concentration
II. Get the working concentration
III. Refer to directive 1999/45/EC (... dangerous preparations), article 3, point 3, from where you are led to Annex II part A and then to part B

The procedure according to the directive should be as follows:
- Select the danger category, e.g. corrosive (KOH, NaOH),
- See in Annex II part A under 4
- From there you proceed to part B table IV for corrosive substances, where you get the danger symbols and the R phrases according to your working concentration for e.g. KOH or NaOH; example: concentration between 5 and 10 % you assign C and R 34

For other danger categories (toxic, irritant, mutagenic, ….) you proceed likewise.
For environmental hazards refer to Annex III.

Remark:
The mentioned directive 67/548/EEC is only applicable in case of the pure substance or very high concentrations.

2. Change of pH

Should be indicated in newer SDS

3. Change of German water pollution classes

Procedure has to follow the German “Administrative Regulation on the Classification of Substances Hazardous to Waters into Water Hazard Classes” (VwVwS, 17.5.1999) – non approved translation from www.umweltbundesamt.de; (note: the column model translates Water Hazard Classes as Water Pollution Classes).
English “Guidelines for self-classification” are available under: http://www.umweltdaten.de/down-e/einstuf.pdf; in difficult cases please consult this guide.

Generally spoken we have to follow the classification of mixtures, based on the water hazard classes of the components (guide: item 5.1) Annex 4, Description of the procedure in order to classify preparations and mixtures.

The computation rule in Annex 4 … first requires the determination of the WGK (water hazard class) of each single component by the methods that apply to substances in general (firstly it is checked as to whether they have been entered into the catalogue: http://www.umweltbundesamt.de/wgs-e/wgs-syn-suche.htm; if not there, the class can be determined according to table annex 2, below). If the identity of a component is un-known or undefined, then as a precaution WGK 3 is assumed for that component.
The mass fractions of the individual components are added up by their WGK, and the WGK of the mixture is then determined according to Table 5. Components are taken into account if their fraction surpasses the following thresholds:

- 0.1% in the case of carcinogenic substances
- 0.2% in the case of all other substances
- If carcinogenic substances are actively added to a mixture and their fraction is less than 0.1%, the mixture is classified at least into WGK 1; the same applies when the fraction of WGK 3 additives is less than 0.2%.

Table 5: Computation rule for the derivation of the WGK of a mixture from the WGK of its components

Ingredients (components)	**Result**			
	WGK 3	**WGK 2**	**WGK 1**	**non-hazardous**
WGK 3	≥ 3 %	0.2 to 3 %	< 0.2% in case of additives	< 0.2% (no additives permitted)
WGK 2		≥ 5%	0.2 to 5%	< 0.2%
WGK 1			≥ 3%	< 3%
non-hazardous				
R45 (carcinogenic)	≥ 0.1%	≥ 0.1%, but WGK 2	< 0.1% in case of additives	< 0.1% (no additives permitted)

Example 1:
If a mixture contains a total of 3% of WGK 2 components and no WGK 3 components, this yields WGK 1 for the mixture as a whole.

Example 2:
If a 0.05% fraction of a WGK 3 component is added to a substance non-hazardous to waters, the mixture is classified into WGK 1. If, however, the substance contains this component only as an impurity resulting from the production process, then it is "non-hazardous to waters".

Example 3 (dilution):
A mixture containing a total of 20% of WGK 2 components and 80% of WGK 1 components is classified into WGK 2. If the mixture is diluted with water at a ratio of 1:1, yielding a fraction of 10% of WGK 2 components, it is still classified into WGK 2. If, however, it is diluted at a ratio of 1:4, the total fraction of WGK 2 components is only 4%, and the diluted mixture is classified into WGK 1.

Table Annex 2: Classification of substances acc. to R-phrases

Number of points	1	2	3	4	5	6	7	8	9
Ecotoxicity and degradation/bio-accumulation undetermined				52/53 x		51/53 x		50/53 x	
Ecotoxicity undetermined			52			50 x			
Abbau/Bioakkumulation undetermined			53 x						
Acute oral and/or dermal toxicity to mammals undetermined	22 65 21		25 24		28 27 x				
Carcinogenic and/or mutagenic effects		40							45 and/or 46
Irreversible effects		40/21 40/22		39 39/24 39/25		39/27 39/28			
Repeated exposure		33 48 48/21 48/22		48/24 48/25					
Toxic effects on reproduction		62 and/or 63		60 and/or 61					
Harmful reaction with water		29							

x: Number of points in cases where one or several of the characteristics "ecotoxicity", "degradation/bioaccumulation" and "acute toxicity" are not determined, or unknown

The evaluation points and default values allocated to a substance are added up to obtain the total number of points, and thus the water hazard class:

Total number of points	Water hazard class (WGK)
0 to 4	1
5 to 8	2
9 and more	3

When the total is 0 the substance may be classified as "non-hazardous to waters" if it fulfils certain other prerequisites; see Section 3.7. of guide

EXAMPLE FOR CLEANTOOL:
Let’s assume we have an aqueous cleaner containing 20% of KOH and 35% of surfactants (e.g. LAS) and the SDS states a WGK (water hazard/pollution class) 2.
The agent is then diluted to 10 % for the working concentration.
KOH has a WGK of 1 (catalogue) and comes now to 2 %
LAS has a WGK of 2 (catalogue) and comes now to 3.5 %
Checking from table 5 (above) the resulting WGK is 1 for the working concentration.

4. Change of waste key codes

5. Change of S-phrases

Directive 1999/45/EC (... dangerous preparations), article 10, point 2.6:

The indications giving safety advice (S phrases) shall comply with the wording in Annex IV and with Annex VI to Directive 67/548/EEC and shall be assigned in accordance with the results of the hazard evaluation carried out in accordance with Annexes I, II and III to this Directive.