More than cleaning

TESTING PAYS OFF

Qualified preliminary tests as the basis for the selection of suitable systems

System-specific solutions in industrial cleaning technology are to a large extent determined by the customer's task-related requirements. The higher the degree of technically necessary cleanliness in the series production process has been fixed, the more important the integration of all relevant factors in the design of the quoted system. Qualified preliminary tests create the opportunity to prove feasibility and the efficient implementation of cost-effective everyday operations.

Companies with many years of experience in systems operation have detailed knowledge with respect to the interdependency of upstream and downstream processes. Moreover, they have well-defined ideas regarding the feasibility of the respective cleaning processes required and of the different chemical and washing related mechanical capabilities in combination with the established ways of treating media. We may therefore assume that well-defined demands are made on the suppliers of cleaning systems and that procedure and configuration of the system are specified in detail. However, the experience values of the companies can rarely be implemented on a one-to-one basis at any given time. In such cases both partners have to invest the necessary time to conduct realistic preliminary tests, preferably involving an appropriate chemical supplier.

In this connection, together with optimization of the preliminary processes to achieve the defined surface quality prior to cleaning, four questions are of major importance:

1. **Which cleaning media** washing-related technical procedures and effects of treatment are basically suitable and with which timeframes for the removal of undesired particulate or filmy contamination on the component surface?

2. **Which system configuration** ensures that dissolved impurities are immediately removed from the area of the component and do not settle again on the component surface through re-contamination?

3. **Which media treatment systems** are suitable for achieving the required cleaning quality and how do they contribute to the service life of the media used?

4. **Which demands** on the cleaning technology result from the follow-up processes?

In LPW's in-house technical center
cleaning and drying experiments regularly take place with different types of systems

FUNDAMENTALS OF SUCCESSFUL TESTING

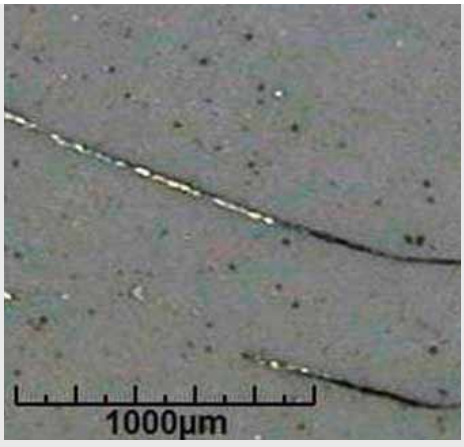
Systems manufacturers should be able to provide references demonstrating the necessary experience of similar projects related to the tasks required. Should this not be the case, the involvement of a chemical supplier or consultant should be considered who is familiar with the task and can prepare relevant procedural proposals in his laboratory in advance. Further, organizational and technical prerequisites must be available at the company in the form of a process technological department for the design of appropriate test procedures, a dedicated test center with corresponding demonstration systems allowing a simulation of the process. Further, the availability of suitable measuring and analysis procedures for immediate and constant evaluation is of major importance.

However, without the active involvement of the customer it is mostly impossible to carry out meaningful tests. His presence is desirable but not absolutely necessary. Yet the customer must invest the required time in advance in order to guarantee reliability and transferability of the test results to future production processes in everyday operation. His assistance should include at least the following areas:

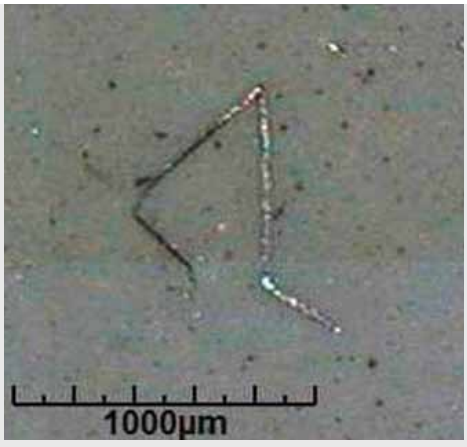
1. **Provision of original contaminated components** in defined input quality (e.g. type of contamination and absence of burrs).
2. **Clear definition of demands on the component** including mention of the processes following the cleaning process.
3. **Inclusion of positive and negative experiences** with similar tasks in the company.
4. **Specification of cycle time** for each component and batch loading.
5. **Mention where applicable of existing constructional restrictions** to the mechanical washing action, drying procedure and /or chemistry.

POSSIBLE PARTNERS

When conducting preliminary tests, the collaboration of different partners plays a major role. For chemical suppliers prerequisites such as laboratory and analysis facilities are decisive, as well as a suitable product portfolio for the task-specific design of chemical cleaning agents and practical experience in the support of cleaning processes in regular production processes. The suppliers of special media treatment systems, however, can support preliminary tests at the system manufacturer or on site at the customer by conducting their own preliminary tests or by providing suitable products – generally bypass flow treatment systems such as centrifuges, magnetic separators, ultra-/microfiltration, vacuum evaporators or circulatory systems. In addition, the involvement of the respective end customer provides the benefit of implementing cost and procedure optimization insofar as appropriate expertise is available on the user side.



Largest metal particle
2328 µm x 581 µm



Second largest metal particle
858 µm x 467 µm

First test run
This is how an analysis result may look like after initial tests: Characteristic chips, which may occur for instance on non-deburred fine threads, impede the desired result.

TESTS IN REFERENCE SYSTEMS AND IN THE LABORATORY

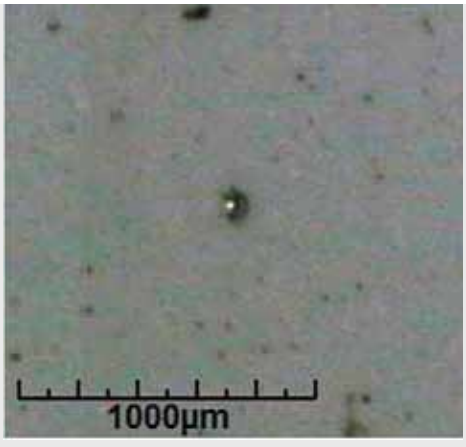
The viewing of similar reference systems and the conducting of preliminary tests on these systems are often a useful alternative or helpful addition to tests in the laboratory or in the technical center. The systems have already proved themselves in tough everyday production conditions. Alongside the feasibility of the respective demands on technical cleanliness, practical experiences relating to maintenance effort, availability and ease of operation can be collected.
Even if the realized task is not directly transferrable, reference visits of this kind are often a sound basis for follow-up tests at the system manufacturer.
For understandable reasons these appointments at customers with high and highest demands can only be organized if there is no competitor situation. At the same time the visit is only of use if the realized system matches the planned one. However, laboratory and technical center tests must of course involve all experiences from the past. They also provide the chance to cooperate in the development of new processes and solutions in order to meet the stipulated requirements more efficiently or at a higher quality.

Analysis
Suitability of the selected process can be checked during the test in our own residual dirt cabinet.

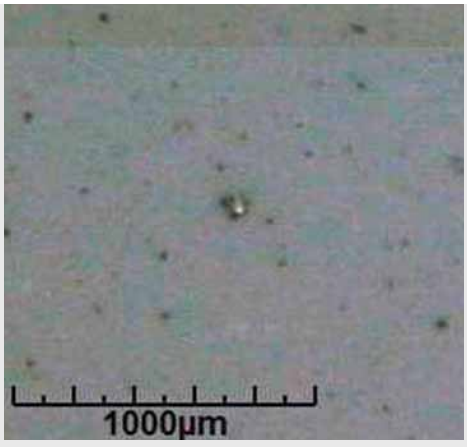
FROM EVERYDAY PRODUCTION AND TEST SCENARIOS

LPW Reinigungssysteme GmbH in Riederich has been asked to implement a fine cleaning task for precision components from the field of diesel fuel injection technology. This was followed by preparation of a quotation on the basis of throughput, material and purity requirements in direct consultations with a suitable chemical supplier. In this connection the system makers submitted a proposal coordinated with the chemical supplier for the procedural and technical processes as a basis for technical center tests with accompanying analysis in our own residual dirt analytics unit.

The two-day tests showed that the target of the largest metal particles ←200µm could not be realized in any of the tests. Constant change in the parameters led in the accompanying residual dirt analysis of the components to the conclusion that a decoupling of the total residual dirt values from the particle size takes place. Further, the "outliers" displayed different characteristics from the other metal particles. A microscopic analysis of cleaned and uncleaned components finally revealed that the components to be cleaned had not been completely deburred in the preliminary process. After the customer had optimized the preliminary processes, the follow-up test already produced the desired values in the first run.



Largest metal particle
122 µm x 76 µm



Second largest metal particle 99 µm x 79 µm

Optimized test
After optimization of the preliminary tests the required value of ← 200µm in metal particles was achieved.

EMPIRICAL VALUES

Customers frequently have mixed feelings about preliminary tests. They are often concerned that if they disclose necessary information and are willing to provide the time required, they will be assuming responsibility for system capability and cleaning quality. By rejecting such preliminary tests, however, the user foregoes the opportunity to separate the wheat from the chaff and to help to work out the most economical solution for the tasks required taking into account investment and follow-up costs. After all, the described tests create a high degree of certainty for both system supplier and customer which fulfills the quoted scope of delivery and the task at hand. What we ourselves have seen, we don't need to believe – we know it.

Microscopic analysis			
Scale	X: 6,3 µm/Pxl Y: 6,3 µm/Pxl	evaluation (mm)	44

Largest metal particle	length (µm)	2328	width (µm)	581
Largest non-metal particle	length (µm)	163	width (µm)	67

Length of largest fibres² (µm)	1574	1574 total length fibres² (mm)	2440

		Number of particles¹ of filter membrane		Number of particles¹ per component		Number of particles¹ per 1000 cm²	
Particle size (µm)	Code	total¹	metal	total¹	metal	total¹	metal
Summarized statistics:							
› 600	J-K	6	6	0,6	0,6		
100-600	F-I	138	112	13,8	11,2		
15-100	C-E	10199	607	1019,9	60,7		
Detailed statistics:							
› 1000	K	1	1	0,1	0,1		
600-1000	J	5	5	0,5	0,5		
400-600	I	5	5	0,5	0,5		
200-400	H	35	35	3,5	3,5		
150-200	G	24	22	2,4	2,2		
100-150	F	74	50	7,4	5,0		
50-100	E	754	217	75,4	21,7		
25-50	D	3655	298	365,5	29,8		

Test reports
Under consideration of the chemical supplier's preliminary tests the test results in the technical center provide information about which system technology can provide the required results with a high level of process reliability.

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