

New Formula for Dissolving Power

User-Friendly Cleaning Agents and Solvents

The European Chemicals Regulation REACH has led to a new – and more particularly, intensive – toxicological assessment of well-known and widely used solvents and cleaning agents. Commonly used substances such as NMP (n-methylpyrrolidone), NEP (n-ethylpyrrolidone) and DMF (dimethylformamide) were suddenly subject to far more stringent classification and labeling. The pressure on companies to eliminate employee-endangering products and to replace them with user-friendly alternatives increased massively as a result.

The proven products NEP, NMP and DMF are employed in a very wide range of different applications: Whether it is in dissolving and removing resins and coatings of, for example, polyurethane, epoxy resin and polyamides on machine parts or soiled tools, or for producing corresponding plastic solutions and emulsions.

When it comes to the production or removal of adhesives, the same problems and demands arise in practice. Growing technical demands, more stringent environmental regulations as well as new legislation and regulations are demanding more and more customized solutions.

The necessary cleaning work is often carried out manually using brushes,

cloths, etc., in open production vessels and tanks. The cleaning personnel is therefore exposed directly and constantly to these products by inhaling, odor and accidental skin contact.

Slightly less critical from the point of view of workplace hygiene is the cleaning of closed systems, such as metering lines or mixing and metering heads in 2-component plastics processing systems. Nevertheless, the same restrictions also apply here as for the “open” applications.

Due to the more stringent classification/labeling of the commercially available solvents, many users and processors of such products are on the look-out for alternatives. In most cases – apart from the technical function – the focus of the

new orientation is on the lowest possible toxicity, the best possible ecological properties and positive workplace-relevant factors. As a rule, the latest-generation cleaning agents satisfy the above-mentioned criteria (**Table 1**).

Commercial aspects are naturally of great importance. Interestingly, the price/performance profile of the new cleanser generation is on a par or even better level than that of the conventional solvents.

The products listed in **Table 2 and 3** represent merely a selection of various possibilities for dissolving and cleaning in plastics systems. Where necessary, customized products are formulated and produced that are geared to the individual needs and wishes.

Designation	Parameter		
“Old” products	Flash point [°C]	Water solubility	Designation according to CLP
N-Methylpyrrolidon (NMP)	91	Completely	H 315 / H 319 / H 335 / H 360D
N-Ethylpyrrolidon (NEP)	91	Completely	H 318 / H 360
Dimethylformamid (DMF)	56	Completely	H 226 / H 312 / H 319 / H 332 / H 360D
“New” products	Flash point [°C]	Water solubility	Designation according to CLP
Resin-Clean EXP-10/30	68	Completely	H 314 / H 335 / H 336
Resin-Clean EXP-10/50	95	Partially	H 315 / H 318
Resin-Clean EXP-10/70	95	Partially	H 315 / H 319
Resin-Clean EXP-10/70 V-2	95	Partially	Labeling-free
Resin-Clean EXP-10/90	95	Completely	H 314 / H 335 / H 336
Resin-Clean EXP-10/95	95	Completely	H 314 / H 335 / H 336
Resin-Clean EXP-10/100	95	Completely	Labeling-free
Resin-Clean EXP-10/200	>100	Partially	H 314 / H 335 / H 336
<p>H 226: Flammable liquid and vapour H 312: Harmful in contact with skin H 314: Causes severe skin burns and eye damage H 315: Causes skin irritation H 318: Causes serious eye damage H 319: Causes serious eye irritation H 332: Harmful if inhaled H 335: May cause respiratory irritation H 336: May cause drowsiness or dizziness H 360(D): May damage the unborn child</p>			

Table 1. Comparison of the ecotoxicological properties of “old” and “new” products

Product	Flash point [°C]	Polyurethane	Epoxy resin	Polyester	Acrylate	Polyamide	Adhesives/ glues	Paints/ lacquers
Resin-Clean EXP 10/30	68	+	++	++	+++	o	+++	+++
Resin-Clean EXP 10/50	95	+++	+	+	++	o	++	+
Resin-Clean EXP 10/70	95	++	++	++	++	o	++	++
Resin-Clean EXP 10/70-V2	95	++	+	+	++	–	+	+
Resin-Clean EXP 10/90	95	+++	++	++	+++	+	+++	+++
Resin-Clean EXP 10/95	95	+++	++	++	++	o	++	+++
Resin-Clean EXP 10/100	95	++	++	++	++	o	++	++
Resin-Clean EXP 10/200	>100	++	+++	++	++	o	++	+++

+++ best dissolving power ++ very good dissolving power + good dissolving power o moderate dissolving power – poor dissolving power

Table 2. Comparison of the dissolving power of new products, particularly suitable for 1K and 2K systems

Product	Application temperature [°C]	Base material compatibility	Properties
Resin-Clean EXP-10/30	20–50	<ul style="list-style-type: none"> Only limited compatibility with zinc and zinc alloys Other metals very good 	<ul style="list-style-type: none"> Specially for adhesives and paints Universal application
Resin-Clean EXP-10/50	20–80	<ul style="list-style-type: none"> Suitable for all metals 	<ul style="list-style-type: none"> Specially for polyurethane (PU), also in hardened state Universal application
Resin-Clean EXP-10/70	20–80	<ul style="list-style-type: none"> Suitable for all metals 	<ul style="list-style-type: none"> Water-soluble and hydrolysis-stable Universal application
Resin-Clean EXP-10/70-V2	20–80	<ul style="list-style-type: none"> Suitable for all metals 	<ul style="list-style-type: none"> Ideally suited as a rinsing agent for metering and mixing systems Labeling-free, inexpensive
Resin-Clean EXP-10/90	20–80	<ul style="list-style-type: none"> Limited suitability for zinc and zinc alloys and nickel 	<ul style="list-style-type: none"> Specially for hardened and cured compounds Universal application
Resin-Clean EXP-10/95	20–80	<ul style="list-style-type: none"> Suitable for all metals 	<ul style="list-style-type: none"> Identical with RC-EXP-10/90, specially for PU Universal application
Resin-Clean EXP-10/100	20–80	<ul style="list-style-type: none"> Suitable for all metals 	<ul style="list-style-type: none"> Base product for customized formulations Universal application
Resin-Clean EXP-10/200	20–90	<ul style="list-style-type: none"> Suitable only for steel and ferrous materials and chrome-based alloys 	<ul style="list-style-type: none"> Specially for paints and lacquers and epoxy resin Specially for cured and hardened contamination

Table 3. Detailed application characteristics of the Resin-Clean EXP 10 Series, removes plastics, adhesives, paints and lacquers

A Practical Example: Substitute for NEP Rinsing Agents

A production plant which processes 2K PU in the production of high-quality plastic moldings and coatings used to clean its machine mixing heads and metering line using an NEP-based mixture. Following the announcement of the reclassification of this substance as toxic for reproduction, an alternative had to be found. The successor solution had to have a basis that put a definitive end to the question of toxicity. After an assessment of the technical demands, the product "Resin-Clean EXP-10/70-V2" was recommended. Tests were first performed in the company's own laboratory, later in production.

After a successful test phase, approval and release, all the machines and also many of the soiled tools are now successfully cleaned using the new cleansing agent at comparable cost – but without the problem of toxicity.

A Practical Example: Substitution of NEP as an Adhesive Remover

A toll processor working particularly with 1K and 2K PU adhesives previously used pure NEP to clean the machine parts and tools. Because of toxicological concerns, the customer was willing to test alternatives. After various trials in the laboratory using different products, "Resin-Clean EXP-10/50" was finally chosen. Since hardened PU also had to be removed, the demands on the new product were high. In the meantime the cleaning agent has proved successful over a 3-month trial under production conditions.

Conclusion

As there are allegedly no alternatives or a changeover is associated with considerable disadvantages, products classified as highly critical are still in widespread use. The possibilities illustrated here show that in the meantime, practice-proven, us-

er-friendly and eco-friendly cleaning agents and solvents are available as solutions to practically all problems. These cleaning agents offer the highest possible protection and compatibility for employees and the environment. ■

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