

# Innovations around Laundry and Cleaning

## Conference of SEPAWA Specialist Group “Innovative Cleaning”

F. Schambil\*

On 11<sup>th</sup> May 2017, Dr *Ralf Döring* led a meeting of the newly established SEPAWA specialist group “Innovative Cleaning” in the “deconsecrated church” on the grounds of wfk – Cleaning Technology Institute e.V. in Krefeld. Ten lectures explored new raw materials, intelligent tests and innovative washing machines. The scientific and technical part was supplemented by presentations on universities as innovation engines, as well as on a new tool to predict the success of product innovations.

### wfk – Cleaning Technology Institute

Dr *Jürgen Bohnen*, Director of the wfk Institute, welcomed the participants and introduced his institution. Established in 1949, the wfk currently has around 80 employees and conducts research on the cleaning, reprocessing, functionalisation and hygiene of different materials. Examples include protective clothing, medical instruments and cleanroom textiles. The wfk is actively involved in the national and international development of standards, in addition to consulting for companies. Research projects are often conducted with industrial partners. wfk offers services in the areas of application technology tests and analysis of laundry/cleaning agents, process and equipment research, disinfection and hygiene control. In addition, the Institute’s Brueggen-Bracht satellite office produces test materials that are used worldwide.

“Performance Testing of Detergents and Cleaning Products” was the subject of the presentation by Dr *Emir Lasic* (wfk Krefeld). The efficiency of product innovations must be demonstrated in relation to reference or competitor prod-

ucts. Decision makers in companies as well as buyers for retail chains and similar companies are always faced with the task of purchasing detergents and cleaning products with an optimal price/performance ratio from an extensive range of products, or of verifiably documenting USPs relative to competitors. The wfk-Institut offers a wide range of performance tests for numerous product groups (both household and commercial products) and objectives.

In the second lecture on behalf of the wfk, Dr *Manuel Heintz* spoke on the subject of “Validation of Disinfectant Laundry Procedures.” Laundry procedures are the only process step in which textiles are disinfected in laundries. Therefore, they must be validated to ensure safe textile hygiene. The need to validate disinfecting laundry processes is also anchored in EN 14065: 2016. Within the framework of a working group, a manual was prepared (available free of charge from the wfk Institute). The wfk Institute can support validation by, among other things, testing disinfectants, preparing bioindicators for on-site testing and providing advice/training.

In a further presentation by wfk, Dr *Tatjana Friedrich* reported on the “Preservation and Renewal of the Function of Textile Protective Equipment.” The preservation or renewal of the functional properties of textile protective equipment is already an important task for treatment processes. In addition, new procedures increasingly allow for the renewal during the treatment process of functions that have been impaired by use and treatment, thereby extending the useful life of the treated textile materials. The lecture presented renewable polymer equipment for textile protection, the reversible application of which uses pH value changes (basic pH values in the rinse cycle, neutral to slightly acidic pH values in the rinse phase) that occur during commercial treatment. The speaker



Fig.1 The wfk Institute in Krefeld (Source: Mathis Wienand)

discussed the application of renewable polymer equipment to optimise dirt removal under gentle treatment conditions, to preserve the protective function of warning clothing and to optimise the water vapour permeability of textile protective equipment made of textile laminate.

Dr **Sabrina Kolbe** (wfk Krefeld) addressed the subject “Hygiene Rapid Tests for Internal Self-management.” The wfk Institute has developed a range of rapid tests for the control of hygiene in hygienically demanding areas (e.g., healthcare, food industry) within the framework of self-management. The lecture presented a process control of surface disinfection based on dye-filled proteoliposomes and a biochemical synchronous determination of total bacterial count and hygiene-relevant microorganisms based on lectin-functionalised, thermoresponsive polymer brushes and lectin or antibody-functionalised quantum dots as final product control. Furthermore, an MRSA rapid detection test for surfaces with thermally switchable dosing systems and the loop-mediated isothermal polymerase chain reaction (LAMP-PCR), and a biocatalytic colour indicator system were presented as process control for commercial dishwashing processes.

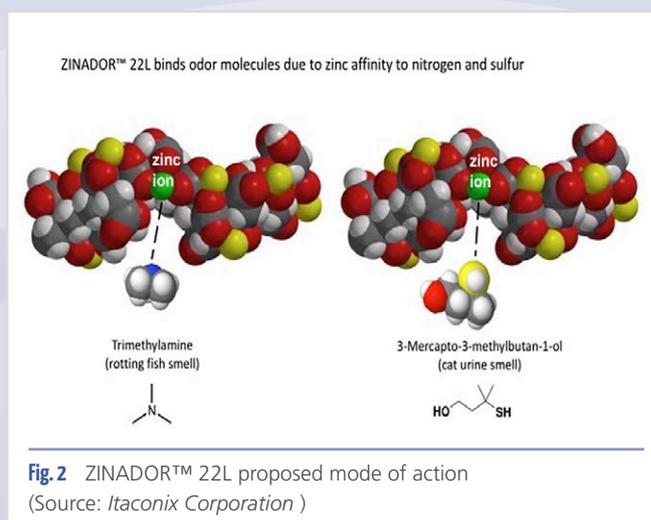
## Innovative Laundry Raw Materials

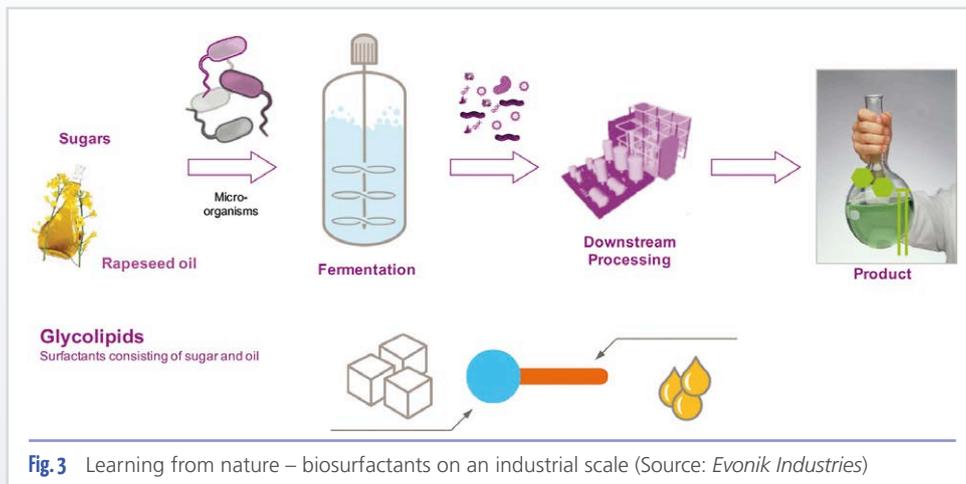
The lecture given by Dr **Yvon Durant** (Itaconix Corp., USA), “Novel Zinc-based Technology for Odor Management in Home Care Applications,” introduced an alternative odour absorber, poly(itaconate). Zinc ricinoleate is characterised by its ability to complex volatile substances with N or S atoms. These compounds are often very odour-intensive, and thus can be neutralised odoriferously. “Molecular modelling” can show that this complexation leads to a strong bond between Zn and N- or S-atoms. Limited water solubility is a disadvantage of zinc ricinoleate (as well as for many other Zn salts) for various applications. With ZINADOR™ 22L, Itaconix has introduced a new water-soluble odour absorber that binds Zn to poly(itaconate). Olfactory molecules then bind Zn atoms with N- or S-atoms, such as trimethylamine in fish or mercapto derivatives in urine. The effect has been widely studied in washing experiments with tobacco, onion or garlic odours, or diethylamine on textiles. A direct comparison with Zn ricinoleate yields virtually identical odour absorption values. Zinador is available as a 26% product, is stable in the pH range 2-11, does not foam, is odourless and leaves no residues on the fabric during washing. The speaker presented detailed formulation recommendations for detergents, stain removers and carpet cleaners. (Fig. 2)

**Fan lie Jaegl ** (IMCD Group, Cologne) reported on “Protein Engineering: an Improved Cellulase for Textile Care in Liquid Detergents.” The global detergent market is growing

strongly, especially for pre-treatment agents, delicate detergents and care products. Justifiably, consumer organisations increasingly include textile protection in their product tests. A global consumer survey by DuPont found that consumers in all regions of the world highly value anti-pilling, colour care and whiteness preservation. These effects are significantly influenced by the presence of cellulases in detergents and washing aids. This presents a great challenge: offering cellulases for liquid detergents that have adequate storage stability in the presence of proteases. DuPont’s Revitalenz®200 offers an optimised cellulase molecule that is suitable for both concentrated European liquid detergents and traditional water-rich Asian liquid products. “Molecular modelling” and “structure function analysis” were used to determine the regions of the enzyme that are sensitive to proteases. The storage stability of the newly developed cellulase is significantly higher than that of alternative molecules. Revitalenz also has a good performance profile: application technical properties after 20 wash cycles, such as anti-pilling on cotton and cotton-polyester, colour maintenance, colour restoration and whiteness preservation, as well as the determined loss of tensile strength, are comparable with those of competitor cellulases. The tests used both test materials (new or previously pilled) and textiles from the market. The concentration of the new cellulase used in the tests ranged from 0.03 to 0.06%.

The theme of the presentation by **Moniec Van Logchem** (Evonik Nutrition & Care GmbH) was “Bugs and Beer and Bumblebees ... the Making of Sophorolipids” Following an introduction to the world of surfactants and an overview of the development from soaps to synthetic surfactants, biodegradable compounds and bio-based interface-active substances, the exclusive use of sustainable sources in production of surfactants was postulated as the next step. Consumers are increasingly demanding environmentally friendly products. Palm kernel oil is coming under growing criticism. Therefore,





**Fig. 3** Learning from nature – biosurfactants on an industrial scale (Source: Evonik Industries)

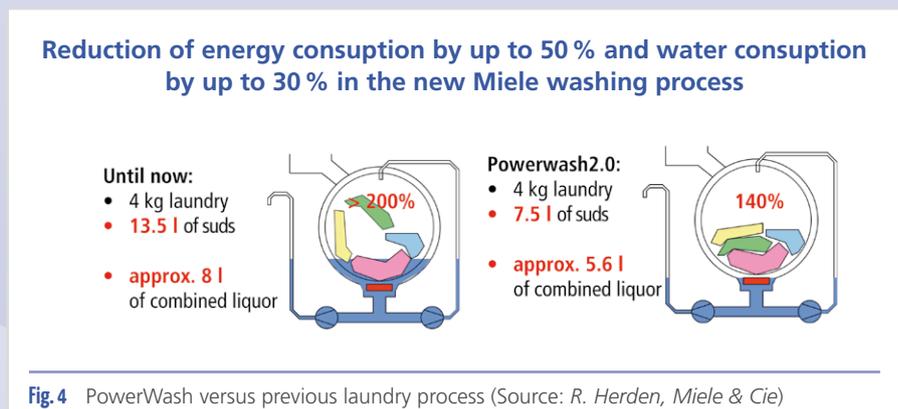
for some time, various manufacturers have been offering sophorolipids as biosurfactants on a commercial scale (Fig. 3). They are based on local raw materials (in Europe, sugar and rapeseed oil). The production technology based on fermentation is now considered mature. Fermentation is carried out with “no genetic engineering” and is based on completely renewable raw materials. The substances are typically mixtures of at least two glycolipids, with C16-C18 saturated or (poly) unsaturated chains. Sophorolipids are highly compatible with other ingredients in detergents/cleaning products, including all enzymes. They have an excellent technical application profile, including good cleaning performance and very good skin compatibility. They are “readily biodegradable” according to OECD 301F and 100 % anaerobically degradable according to EN ISO 11734. Sophorolipids have low aquatic toxicity according to OECD 211 and 202 and meet the requirements for the EU Ecolabel. The complex relationships in the industrial production process and the fermentation process were shown in detail. Sophorolipids offer the detergents and cleaning products industry a new generation of powerful biosurfactants.

### Innovations in Appliances, Consumer Tests and at a University

**Werner Strothoff** (Miele, Gütersloh) spoke on the subject “Washing Machines – Current Developments and Trends.” In the appliance market, “home connection” and the use of apps play an increasingly important role. By connecting to the Internet and offering voice control, new appliances are much smarter. Other trends in the market were presented: minimalist design, replacing dispensing compartments with automatic dispensing, large displays, lighting the washing machine

door, small wall-mounted appliances (for single households), appliances with two drums (large amounts of laundry on top, small textile items below). Many manufacturers now offer washing machines with automatic dosing, with refillable containers (for liquid detergent and softener) or with cartridges that offer increased options (universal detergents, wool detergents, fragrances, fabric softener, impregnating agents, etc.). Washing machines with *in situ*

generation of ozone for disinfection or water softening to reduce detergent consumption are also available. Collaboration between appliance manufacturers and detergent producers is increasingly common. The desire of all househusbands and housewives for a stand-alone appliance that washes, dries and irons has not yet been fulfilled, but a Japanese appliance manufacturer does at least offer an automatic folding machine. Finally, Miele’s PowerWash 2.0 was presented. The consumption values of washing machines (water, electricity) have decreased dramatically in recent decades, but the minimum has not yet been reached. Given that around 70 % of energy consumption in a wash cycle is used to heat the free and bound liquor, Miele’s PowerWash range reduces the free liquor from 8 to 5.6 litres of water. This required the development of a new load recognition system using mass inertia and a new penetration method (spin and spray). A new heating system via steam heating ensures uniform heating of the damp laundry. The higher detergent concentration, as a consequence of the lower water content, improves washing performance and hygiene at low wash temperatures. The process allows higher washing temperatures with the same energy input, or alternatively lower energy consumption with the same washing power. PowerWash is striking for its good washing performance with short program times. (Fig. 4)

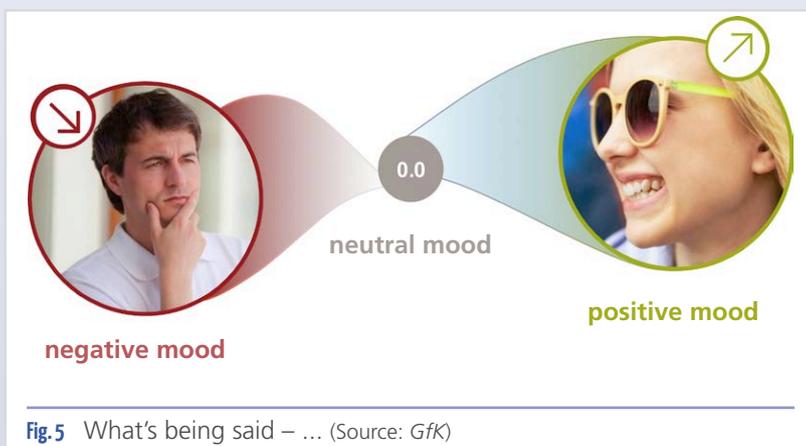


**Fig. 4** PowerWash versus previous laundry process (Source: R. Herden, Miele & Cie)

Dr *Daniel Stengel* of GfK spoke on the subject “Predicting the Success of Product Innovations with Speech analysis.” Around 75 % of product innovations in consumer goods that reach the market fail within 12 months of launch. Successful innovations offer the consumer a greater benefit than established products. Therefore, there is need for better pre-testing of acceptance of new products. Traditional methods capture explicit, reflective thinking. To fully understand the potential of a concept from the customer perspective, GfK measures both implicit and explicit consumer reactions. The lecture presented speech analysis as a new tool to learn the “truth” about the potential of a concept. Not only what consumers say, but also how they say it, provides information about how we think and feel. The analysis of “sentiment” (negative, neutral or positive mood (**Fig. 5**)) offers clues as to what respondents think of an idea. Using verbs and topics, the analysis of “activation” provides the degree of motivation to act. Audio analysis reveals nuances that are not apparent from textual analysis alone: intonation, pitch, and volume provide important emotional nuances. Individual calibration helps to determine culture-neutral measures. The so-called “Market Builder Voice” system provides a better understanding of the emotional impact and potential of a new concept. Using

existing KPIs, the test concepts are compared with a control concept. GfK gives clients a summary and recommendations. The combination of the richness of qualitative research with the accuracy of a quantitative sample provides valuable insights into the added value of a new product idea. The customer also has access to all the audio logs.

Finally, Prof. Dr *Michael Pulina* (Neuss University of Applied Science) used his lecture, “Innovation Engine University – Transformation of Students in the Course of their Studies” to explore current students’ openness to entrepreneurship. Innovation needs intrinsic motivation, entrepreneurship and courage. Individuals’ affinity to entrepreneurship is connected to their willingness to innovate. A survey of 170 part-time or day-release students at the Neuss University of Applied Science examined acceptance of work in a start-up and willingness to be self-employed. Affirmative responses were encouragingly high – 81 % and 65 %, respectively. For day-release students, “team building” is of greater importance and increases rapidly in the third year of studies. “Networking, support and financing”, which likewise increase over the course of studies, are also important. Part-time students in the dual system take this point significantly better. From their second year of study, there is a clear increase in the desire for a single point of contact in the area of entrepreneurship, as well as for seminars on the subject. Respondents in both categories of students support a stronger dialogue with founders. The results of the survey support the idea of establishing an institute for entrepreneurship and enterprise management, which is now being actively pursued.



Dr. Fred Schambil | Fred.Schambil@t-online.de  
Niederstr. 96 | 40789 Monheim | Germany

\*contact