6th AFERA Technical Seminar (April 15 – 17, 2013)

The well-established AFERA Technical Seminar was arranged for the sixth time at its well-known venue in Brussels attracting some one hundred attendees from all in all ten countries. Participants mingled together from literally all over the world, i.e. from far away countries like India, Israel and the United States, the majority, of course, originating from Europe.

Following a selection of presentations will be excerpted, as usual, not at any case reflecting any kind of undue privilege.

H. Doehler (Evonik Industries, Essen, Germany) lectured about his topic “Can Hotmelt Stabilizers Improve the Compatibility of UV Cured Silicones and the Adhesive?” As a matter of fact, UV light might initiate an unspecific reaction between silicone release material and adhesive components ultimately causing an aging effect. Interesting enough, hydrogenated Hot-Melts exhibit the most pronounced UV ageing. A rather complicated auto-oxidation reaction involving peroxide from the silicone is found to be the reason for this undesirable behaviour. Further investigation demonstrates antioxidants and UV absorbers (light stabilizer) are able to reduce or even avoid the effect. Residual oxygen content should be kept below 50 ppm.

“Opportunities and Requirements for Pressure Sensitive Adhesives in Solar Applications“ were presented by P. L. Geiss (University of Kaiserslautern, Germany). Adhesives are employed in a number of applications related to solar energy modules, such as junction boxes, frame bonding, dielectric insulation, backrail bonding, etc. A number of EU construction regulations provide the necessary legal network to ensure mechanical resistance and stability avoiding accidental collapse, deformation and damage of the overall structure. Sustainable use of natural resources is one other ever important requirement. Ageing of overall set-up is a primary issue to be properly simulated and extensively tested in order to avoid failure of construction. Important reasons for ageing are e.g. swelling of adhesive joint, UV radiation, creep under static load, low cycle fatigue, etc. Hence, implementation of standardized and widely accepted test methods is a fundamental imperative.

S. Sinha (3M India) talked about “High performance tapes and labels from Acrylate PSA composition“. Successful employment of acrylic polymers in PSA applications requires the molecules to endow the formulation with at the same time liquid as well as solid state characteristics. For test formulation standard acrylates based on EHA / BA / AA were chosen. Tackifier (e.g. rosin ester) compatibility is predicted by rheological behaviour; glass transition temperature increases linear with an

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progressive decrease of modulus at the flow region. Addition of a reactive amine ("X linker") which is able to interfere with the carbonic acid moieties of the acrylate helps to increase creep level.

J. Lange (Arizona Chemical, Almere, NL) elaborated on "Polymer – Resin Compatbility. Terpene Phenol Tackifying Resins". Compatibility of two substances was substantiated by using the thermodynamic model based on mixing enthalpy and entropy and employing the Flory-Huggins Lattice Model. Introducing Hildebrandt Solubility Parameters the broad compatibility range of terpene phenolic resins was demonstrated reaching from isoprene to acrylic polymers. Similarly, Hansen Solubility Parameters (HSP) were introduced, again resulting in a large interaction radius of terpene phenols and, hence, showing the broad tolerance of this tackifier class. Choosing a testing formulation based on acrylic copolymer, terpene phenol tackifier and crosslinker rather well balanced performance profile of the resulting adhesive was demonstrated. An application overview including solvent based as well as hotmelt PSA employed in several automotive applications as well as on corona treated foams rounded off the overall picture.

"Pre-Treatment of Polymer Films using Excimer Lamps" was the topic presented by R. Wilken (Fraunhofer IFAM, Bremen, Germany). VUV excimer lamps do offer considerable advantages such as high homogeneity, a cold process, possibility of large scale process, etc. Results are indeed overwhelming: 180° peel increases by 5,000% on respectively treated PVC, by 4,000% on PE and by 3,000% by PP (adhesive: 1K PUR Hotmelt). Surface energy measurements suggest the increase employing VUV excimer lamps on PP, PVC and PA being equal or even higher than plasma treatment. Surface modification caused by VUV excimer irradiation is demonstrated also by measurement of oxygen concentration and percentage of carbonyl, carboxyl and ester groups induced on the film surface. In particular on PE oxidation is continuing beyond the ether / alcohol stage thus leading to a further increase of surface energy. Consequently, adhesive strength measured as peel resistance shows a clear positive correlation with increase of surface energy. Concluding it may be stated VUV excimer irradiation being a viable alternative to plasma treatment in film surface activation.

In O. Kameneva (Momentive Specialties, Belgium) word was made on "Expanding the PSA Formulator´s Toolbox with alternative Raw Materials based on innovative new Hydrophobic Vinyl Ester Monomers". Basic idea is the modification of an all acrylic PSA by a highly branched alkyl and hence hydrophobic vinyl ester and by tailored

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polymers made from soft vinyl ester monomers. Adhesion results obtained from such polymers are a pronouncedly improved cohesion / adhesion balance through higher gel content and higher cross linking degree plus better interaction between the adhesive and the substrate. Also moisture resistance is improved resulting in better peel retention, improved water vapour permeability, and higher water whitening resistance. Also tackifier response is improved. Remarkably, the adhesion to low surface energy substrates such as LDPE, HDPE and even PTFE (Teflon™) is remarkably improved. Cohesive strength is demonstrated by high SAFT values.

J. van Holen (Henkel, Düsseldorf, Germany) in his contribution showed up “New Routes towards High Performance Hotmelt Radiation Curable PSAs”. Viewed from the backbone polymer side acrylic compounds are dealt with and subjected to cationic polymerization which requires the incorporation of UV initiated oxirane (epoxy) moieties. Advantages of this type of curing technology are extremely high curing speed, good cohesion and low shrinkage, possibility of thick coating / adhesive layer and no oxygen inhibition, hence, no induction period. All in all, such systems find high acceptance in adhesive, coatings and inks applications. As a result SAFT measurements report failure at temperatures as high as 200°C as compared to free radical cure results of below 50°C (!) resulting from trough-cure deficit. As a matter of fact, complete cure is obtained at coating weights as high as 220 g/m². UV HMPSA do compare well to SBA based material on several surfaces. Excellent anchorage is obtained on foam, the normally “weak link”. Hence such formulations in the author´s words offer some “green” high performing alternative to “classical” solvent based systems.

AFERA Technical Seminar 2013 – a firework of high class presentations with a grateful, ever participant audience. An event truly remarkable and worthwhile repeating it. See you again in 2015!

LION CONSULT (MRCG) May 2013