

# Afera Hosts Another Successful Technical Seminar

*By Astrid Lejeune, Afera Secretary General*

After the enormous success of the 2002 and 2004 seminars, it was only natural that the 3<sup>rd</sup> Technical Seminar held this spring was another big hit within the self adhesive tape industry. Organised and presented by Afera's Technical Committee, the three-day TS took place in the Brussels city centre, bringing together tape industry professionals for updates on the cutting-edge technical issues driving the PSA industry.

## Overview

Held at the **Brussels Marriott Hotel from 5<sup>th</sup>-7<sup>th</sup> April, 2006**,

the 3<sup>rd</sup> TS boasted a record number of attendees from around the globe: **145 participants from 15 European countries and the U.S.** Of particular note was the attendance of 18 non-member companies, as well as a number of attendees who registered on-the-spot. Although the event is open to all tape industry professionals—both Afera

members and non-members alike—the majority of attendees were from **R&D (44%) and technical service divisions (22%)**. The remaining third came from marketing (11%), sales (5%), processing (5%), general management (4%), engineering (4%), customer service (3%) and quality assurance (2%) departments.



By popular demand, the biennial event's working programme was extended from two- to **three days of technical lectures and networking activities**. Included in the programme were **24 presentations of technical papers**, 25 minutes each, by technical experts from distinguished tape industry companies and organisations, as well as a **40-minute panel discussion forum following each half-day session**.

A new addition to the event, a **table-top exhibition showcasing products and services of tape industry businesses**, took place on 6<sup>th</sup> April at the same venue. During the cocktail hour on day two, **Cytec Surface Specialties** (both Belgium and U.S. location representatives), **ExxonMobil Chemical Europe** (Belgium), **Herbert Olbrich GmbH & Co.** (Germany), **Nimble Shows & Media GmbH** (ICE, Germany), **Pagendarm BTT GmbH** (Germany), **F.lli Maris SpA** (Italy), **Eastman Chemical** (Netherlands) and **Collano AG** (Switzerland) exhibited their latest advances in PSA technology while TS attendees made the most of the opportunity to mingle with a wide range of suppliers and customers from the self adhesive tape sector.

The TS was **chaired by Lutz Jacob of ExxonMobil Chemical Europe and Afera's Technical Committee Chairman**. The four **Session Chairmen** were **Chrétien Donker of Eastman Chemical, Andre Thyssen of 3M Laboratories Europe, Ralf Rönisch of Henkel, and Peter Broschk of tesa**.

## Feedback

The **participant survey** conducted at the conclusion of the TS yielded **very positive responses** in the areas of the event's organisation, overall content and accommodation. Top ratings went to the advantageous blend of seminar topics, the quality and thoroughness of the proceedings book and the excellence of the hotel facilities and service. Numerous comments were also made about the good balance of scheduled instruction and networking time, as well as the relatively high level of quality of papers and lecturers.

With one-third of event attendees responding to the questionnaire, nearly all of the 24 presentations received **high marks**. The four most popular papers: “**REACH, the New Chemicals Policy in Europe**” by **Leon Rodenburg of Eastman Chemical BV (Netherlands)**; “**How Can Tensile Tests be Useful to Design-Optimised PSA?**” by **Costantino Creton of ESPCI, Laboratoire PPMD, Paris University (France)**; “**A New Generation of Hot Melt Tape Formulations, Using Blends of SIBS and SBS Block Copolymers and New Hydrocarbon Tackifying Resins**”, by **Chrétien Donker of Eastman Chemical BV (Netherlands)**; and “**Progress Toward Understanding PSA Tape Design**”, by **Frank Voermans of Alveo AG (Switzerland)**, co-authored by **Kerstin van Wijk of National Adhesives (Netherlands)**. *See reviews of all of the presentations below.*

In terms of the new product-showcasing event on this year’s programme, exhibitors found the table-top exhibition both socially stimulating and professionally worthwhile, as most made new contacts.



## **Wednesday’s Programme – Session 1**

### **Radiation-Curable PSAs**

Following a buffet lunch and opening remarks by TS Chairman Lutz Jacob, Wednesday’s programme, Session 1, commenced with the presentation

“**Radiation Curable PSAs – Improved Products for Tapes and Assembly**”, given by **Detlef Machei of Novamelt GmbH (Germany)**. Mr. Machei discussed the current three types of radiation-curable PSAs available: UV-acrylic HMPSAs, UV-rubber based HMPSAs and UV-polymerisable liquid PSAs.

UV-acrylic HMPSAs, developed to substitute for solvent borne acrylic adhesives, are used for ‘No Label Look’ labels, wet wipe closures, temperature resistant tapes, and construction tapes and medical products. UV-rubber based HMPSAs, developed to combine the advantages of UV-acrylic HMPSAs and the conventional HMPSAs, are used for tape applications in which high shear and high temperature performance is required—primarily in specialty tapes but in the ‘label stock’ category for products with good temperature resistance as well. UV-polymerisable liquid PSAs are used for converting in a printing press for specialty label constructions.

### **Low Temperature Tack of Hot Melt PSAs**

“**A Practical Way of Predicting Low Temperature Tack of Hot Melt PSAs**” was then delivered by **Iancu Vitian of Bostik S.A. (France)**. HMPSAs are now often used for low temperature labelling applications: either -10°C-5°C (chilled conditions) or -40°C--10°C (freezing conditions). Mr. Vitian explained that the objective was to develop a low temperature tack measurement technique to model and predict tack at these temperatures.

Mr. Vitian achieved an interesting balance of science and experience in his explanation of the two-part study. His ultimate conclusions were that glass transition temperature (T<sub>g</sub>) alone is not a discriminating criterion to assess low temperature performance of adhesives for deep-freeze labels. SBC HMPSAs can be suitably formulated to combine low temperature tack and good converting capabilities. Lastly, probe tack is a practical and reliable method for evaluating adhesives for deep-freeze labels application.

### **Designed Structure of Dispersion Film for High-Performance Adhesives**

**Stefan Kirsch of BASF AG (Germany)** then presented his paper on designed structure of dispersion film, co-authored with colleagues **J. Türk, M. Kutschera, T. Frechen, N.Y. Choi**. The authors set out to improve adhesive properties by separating functional areas of adhesion and cohesion in an

adhesive film and developed the technology to achieve the combination of high adhesion to polar- as well as to non-polar substrates with high cohesion structured particles.

Mr. Kirsch related the development of the new product Acronal® DS 3579 based on this technology. Using well-designed slides, the presenter described how the product exhibits excellent adhesion to steel, PE or PU-foams combined with high cohesion, as well as exhibiting excellent water resistance and emitting low levels of VOCs.

### **Organic, Solvent-Free, Water-Soluble PSAs**

A dynamic presentation entitled “**Developments in the Area of Organic, Solvent-Free, Water-Soluble PSAs**” was delivered by **Roland Milker of ChemCycle Bitterfeld GmbH (Germany)**. According to Mr. Milker, these adhesives form a special group of polymers. They are applied in the manufacturing of diverse technical self adhesive products, such as water-dispersible tapes and self-adhesive labels and are used extensively in medical applications such as OP-tapes and biomedical electrodes.

Solvent-free, water-soluble acrylic PSAs with high mechanical and thermal properties and good adhesion to paper and other typical surfaces are not yet commercially available, although their synthesis, composition, chemical architecture and technical performance are described in a great number of patents (while not discussed by the inventors themselves). The presenter concluded by discussing the related environmental issues of organic, solvent-free, water-soluble PSAs, in addition to their current and future uses.

### **Styrene Block Polymers**

**Noel De Keyzer of Kraton Polymers Research (Belgium)** presented an interesting presentation entitled “**New Opportunities to Formulate PSA Tapes with Styrene Block Copolymers,**” which was well-received, particularly in light of the current limited SBC supply situation. Because of the global short supply of the isoprene monomer compounded by growing global demand, alternative formulation concepts have been developed to try to meet that demand by combining SBC with different elastomeric mid-blocks.

In broadening the formulation latitude, Kraton has developed Styrene-Isoprene-Styrene (SIS), Styrene-Butadiene-Styrene (SBS), Styrene-Isoprene/Butadiene-Styrene (SIBS) and Styrene-Ethylene/Butylene-Styrene (SEBS), four different families of SBC that have specific properties and are used in large volumes in their respective application fields. Mr. Keyzer explained effectively the formulations and highlighted the advantages of each.

### **Curtain Coating for Solvent-Based Acrylic Adhesives**

A very well-received paper on curtain coating was then discussed by **Niels Czerwonatis of tesa AG (Germany)**. According to the presenter, curtain coating is well known as an established coating process within the photographic industry. The challenge is that there is a wide range of product demands for economic, tailor-made coating technologies for each product design.

In several coating trials the suitability for certain solvent-based acrylic adhesives (viscoelastic fluids) was examined. Process boundaries and relevant process parameters were determined. Mr. Czerwonatis concluded that the adhesives could be coated bubble-free on paper liner at increased velocities (up to 200 m/min., an upper speed limit was not found). Curtain stability can be reached at common flow rates, although *below* a critical flow rate, air entrainment occurs at a moderate web speed (the operating window is narrow in this region). Finally, the rheological properties have great impact on the operating window, and the viscoelastic behaviour must also be considered.

## **Thursday’s Programme – Session II**

### **Novel PSA Systems**

The morning session kicked off with the delivery of a paper called **“Novel Pressure Sensitive Adhesive Systems for Tape Applications”** by **Benno Blickenstorfer of Collano AG (Switzerland)**. Mr. Blickenstorfer described the challenges which the technology of UV-curable PSAs faces: high adhesion together with high cohesion, higher coating weights for uneven or structured surfaces, high adhesion under load and at elevated temperatures, low out-gassing and the need for high production speeds.

Novel UV-curable PSA systems based on liquid rubber polymers can cope with certain limitations or established UV-curable HMPSA technologies. High cohesive strength at high coating weights can be achieved, outperforming liquid adhesive systems regarding process/coating speeds. Furthermore, they allow for a wide range of formulation options. The presenter concluded that although further application areas need to be developed, these novel systems are a valuable addition to the existing and established technologies of UV-curable HMPSAs.

### **Construction Tape in Architecture**

Next, **Jeroen van Nieuwenhuizen of MoveYou Architecture & Research (Netherlands)** discussed construction tape possibilities in architecture in his entertaining presentation **“You Name It, I Tape It!”**. He based his paper on ideas and results from current PhD research at the University of Eindhoven, in which the relationship between product development, detailing and architecture forms the central theme.

Mr. Van Nieuwenhuizen explored how the use of tape in architecture changes construction concepts, methods and architectural detailing. He also discussed product development in terms of tapes used in traditional methods of constructing buildings and thought about architecture, as well as product development/construction tapes of the future.



### **Solventless Technology for Silicone PSAs**

**“Advancements in Solventless Technology for Silicone PSAs”** was next on the agenda, presented by **Alexander Knott of Dow Corning SA (Belgium)**.

This highly-rated, straightforward presentation covered silicone PSAs (SiPSAs) and the performance of past solventless attempts; current solvent-based and a novel solventless SiPSA (patent pending) using 180°C peel; Polyken probe tack, texture analyser, high-temperature shear and rheology testing procedures.

SiPSAs have been used for many years in areas where organic PSAs fail. One of the most important uses is in applications concerning temperature extremes. All SiPSAs available on the market are offered at 50-60% solids in solvent. While many organic PSAs have found alternative delivery systems (emulsion, hot melt, etc.), industrial SiPSAs have been slow to evolve with the times. Recent advancements in silicone-based raw materials allow formulating solventless SiPSAs with properties and high-temperature shear performance of common solvent-based SiPSAs.

### **Radiation-Curable Warm Melt PSAs**

**Victor Lu of Cytec Specialty Chemicals, Inc. (U.S.A.)** presented a paper on **“Radiation-Curable Warm Melt PSAs”**, which he co-authored with colleagues **Brian Maxwell, Jeffrey Wang and Jim Stockhausen**. Mr. Lu discussed the radiation-curable PSA (RC-PSA) formulations and the adhesion performance for industrial tape applications.

RC-PSAs offer many important advantages over conventional technologies, such as higher productivity, better processing flexibility, lower processing temperature and zero VOC emissions. Recently, a new generation of acrylated urethane resins for RC-PSA applications has been developed by Cytec Surface Specialties. The new acrylated urethane resins exhibit excellent compatibility and UV-curability with many tackifiers, workable viscosity under warm melt conditions and good

adhesion/cohesion balance. By tailoring the formulation, a wide range of adhesives can be developed for different industrial applications.

### Continuous Production of Hot Melt & Adhesives – Enhancement in Twin-Screw Extrusion Processes

In his highly-detailed presentation on a popular topic, **Pietro Lavaggi of F.lli Maris SpA (Italy)** explained that the continuous production of adhesives by the co-rotating twin extruder was introduced 25 years ago. Since then, several mechanical improvements have been achieved, as well as a better understanding of process behaviour and analysis. The quality, productivity and safety of adhesives production has greatly improved.

As witnessed at Maris' testing facilities, Mr. Lavaggi reported that the twin-screw intruder is constantly undergoing improvement. Thanks to new screw geometries, more effective screw configurations can be assembled. A direct consequence of this is increased output per machine size, a tight control of melt pressure and an almost absent (or limited) polymer degradation. According to the presenter, promising performances have also come from the continuous production of solvent-based adhesives.

### Stabilisation of Hot Melt Adhesives – Novel Aspects

Novel aspects of stabilisation of hot melt adhesives was discussed by presenter **Dietmar Mäder of Ciba Specialty Chemical, Inc. (Switzerland)**. In his popular, instructive lecture, Mr. Mäder touched on the benefits of antioxidants, stabilisation of adhesive raw materials, stabilisation of SBC hot melts, PSAs for high-temperature applications and stabilisation of PU-HMA.

Mr. Mäder ultimately proves that Ciba® Irganox® 1726 is an effective antioxidant for SIS and SBS hot melt adhesives because of the following factors: outstanding mixing stability, excellent colour stability, excellent viscosity retention and exceptional efficiency at low concentrations. Furthermore, Irganox® 1726 is suitable for PU-HMA because of excellent colour stability, and it is also effective in PSA application for its excellent tack retention, especially at high temperatures. Irganox® HP 2225 is an effective antioxidant for SEBS hot melt adhesives due to factors such as excellent colour stability and excellent viscosity retention. It is also suitable for EVA and APAO systems.

## Thursday's Programme – Session III

### REACH

**Leon Rodenburg of Eastman Chemical BV (Netherlands)** presented one of the most well-received papers of the TS entitled “**REACH, the New Chemicals Policy in Europe**”. Outlining a very relevant subject in an attention-grabbing manner, Mr. Rodenburg expounded the strong industry support of the goals of the Registration, Evaluation and Authorisation of Chemicals (REACH), i.e. to protect human health and the environment. This European legislation is expected to come into force no earlier than 2007.

The proposal for REACH, as it is currently tabled, is very burdensome for the chemical industry and its customers. If prioritisation is only

based on marketed volume, the goals of REACH may not be achieved, because of the vast number of

**Cost of testing**

30 to 40 million test animals needed

quantity per annum (metric tonnes)	testing & registration (€)
1 – 10	45,000
10 – 100	320,000
100 – 1 000	1,000,000
> 1 000	2,600,000

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promoting the interest of the Self Adhesive Tape Industry

evaluations that must be undertaken. Industry pursues a risk-based approach with proper social-economic assessment. The presenter remarked that it is questionable whether the cost of the programme is proportional to the assumed health and environmental benefits.

### **UV-Curable Adhesives**

“**UV-Curable Adhesives**” was then presented by **Christian Decker of Polymer Photochemistry Laboratory, CNRS (France)**. Mr. Decker effectively outlined the recent progress made in the development of different types of UV-curable adhesives, with respect to both the resin formulation and the main characteristics of the photopolymer obtained. He focussed on the basic chemistry involved in some typical photo-crosslinking polymerisation processes and their kinetic analysis, because, the final properties of UV-curable adhesives depend on a thorough understanding and control of the manifold reactions occurring during such ultra-fast molecule-to-material transformations.

Mr. Decker then discussed the main applications of UV-curable adhesives in the context of the increased development of such systems in a large variety of industrial sectors where they are used as structural adhesives to bond metals, glass and plastic components, sealants or encapsulation compounds, and pressure-sensitive- and hot melt adhesives.

### **Engineering Applications**

**Paul Geiss of Kaiserslautern Univ. of Technology (Germany)** was next with a well-balanced presentation on “**PSAs in Engineering Applications – Potentials and Drawbacks**”. Mr. Geiss showed that the viscoelastic nature of PSAs offers significant benefit in applications where dissipation of energy to reduce vibration and viscous flow to reduce thermal stress are required.

According to the presenter, viscoelastic behaviour can be theoretically predicted and analysed by means of mechanical models including combinations of elastic and viscous elements to simulate the time-dependent viscoelastic stress-strain response to mechanical loads. By understanding and applying basic principles of pressure sensitive rheology, new challenging applications in engineering applications can be realised in the future.

### **Hot Melt Curtain Coating**

Many people are talking about curtain coating for hot melt, which was the topic of a paper delivered by **George Gillissen of Nordson Engineering GmbH (Germany)**. Mr. Gillissen focused on the technology—what it is and its pros and cons. Although curtain coating for dispersions is well-known and widely in use, curtain coating for hot melts is less known because of the different cohesion properties of the adhesive. It is proving to be useful in various areas, such as closed films at grammages below 15 gsm, in which there is no physical stress on the web due to lack of contact.

New markets for hot melt curtain coating are of major interest, encouraging custom-made solutions for certain application needs. The result is a need for collaboration between the end user, the adhesive supplier and the technology supplier. The presenter concluded by highlighting Nordson’s Curtain Coat™ technology in the form of a high-performance, non-contact coating tool. This enables the use of a wide range of hot melt adhesives for a wide variety of add-on weights, only limited by the rheological behaviour of the adhesives.

### **Cationic & Free Radical UV-Curing Silicone Release Coating**

The last presentation of the session was made by Sascha **Herrwerth of Degussa AG (Germany)**, entitled “**Cationic and Free Radical UV-Curing Silicone Release Coating**”. Mr. Herrwerth skilfully described the two UV-curable silicone release systems on the market: one using UV free radical curing silicone acrylates and the other UV cationic curing epoxy silicones. Both methods can be used to produce release coatings with release forces, which can be adjusted by the degree of modification of the silicone backbone.

Mr. Herrwerth expounded the advantages of radical and cationic curable systems: The radical polymerisation of the acrylate groups is much faster compared to cationic polymerisation. Therefore,

cure is reached more quickly with silicone acrylates, allowing further coating operations to take place without waiting for a post-cure of the silicone. The radical curable system requires more technical effort; however, inerted UV units are state-of-the-art, reliable and widely available. Cationic curing can take place without inerting the curing unit; therefore, simpler equipment with lower investment costs can be used. A review of the new products which Goldschmidt has developed to improve the curing systems was also made by the presenter.

## Friday's Programme – Session IV

### PSA Overview

First thing Friday morning, **Andreas Gross of Fraunhofer IFAM (Germany)** presented a well-received general overview of PSAs (acrylates, silicones, rubber). He discussed various types of classifications of PSAs.

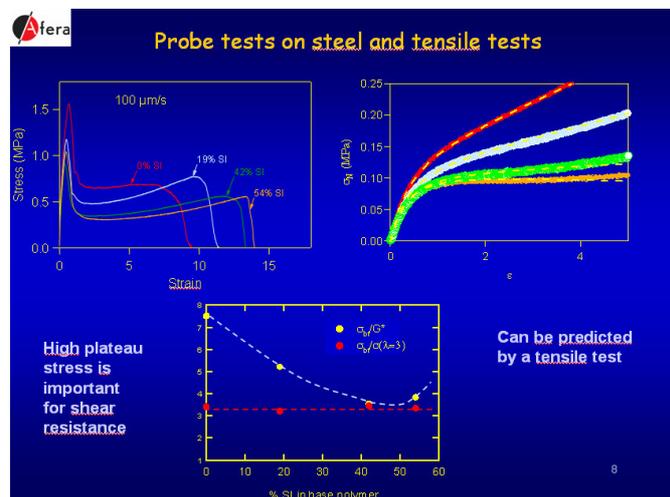
First, regarding classification according to the properties of the resulting bonds, Mr. Gross touched on permanently adhering systems, detachable systems and special adhesives. Methods used to apply adhesive films to support materials (in organic solvents, aqueous dispersions, on a melt (solvent-free), polymerisation) and mechanical behaviour (cohesion strength) of PSAs were also reviewed.

Next, Mr. Gross classified PSAs according to their chemical composition, detailing the many specific features of acrylates (high-performance, double-sided mounting tapes, medical and food industry applications), rubber (double-sided adhesive tapes, butyl rubber used in tubing) and silicones (transfer adhesive tapes and aerospace industry-, low temperature- (e.g. labels), electrical and heat insulation-, instrument construction- and medical applications). Lastly, the presenter classified PSAs according to manufacturing method (application on support materials).

### Tensile Tests

**“How Can Tensile Tests be Useful to Design-Optimised PSA?”** was posed by **Costantino Creton of ESPCI, Laboratoire PPMD, Paris University (France)** as the topic of his highly-rated paper. According to the presenter, some of the adhesive properties of PSAs cannot be easily predicted by their rheological properties in the linear regime. Simple tensile tests are very informative on the crosslinking and entanglement structures of PSAs.

Mr. Creton discussed the interesting relevance of the Mooney-Rivlin Model in which  $C_1$  refers to crosslink points and  $C_2$  to entanglements. Tensile tests can be used as a powerful and complementary tool of characterisation of PSA properties. Finally, many application properties are controlled by the ratio between non-permanent and permanent contributions to the elastic network.



### New Pilot Coater

**Christoph Dittlich of Coatema Coating Machinery GmbH (Germany)** was next with a talk about a **“Unique Demonstration Facility for the Coating of UV-Curable Silicones and Adhesives for the Production of PSA Materials.”** In conjunction with Goldschmidt/Degussa, Coatema has used a modular construction method for a lab coating line for manufacturing self adhesives such as labels and tapes. The new pilot plant offers the customer an outstanding basis for product development, process optimisation and fulfilment of the future requirements of the various PSA markets.

The equipment design allows for different manufacturing processes for paper and film finishing, utilising the various possibilities of coating and web guiding. With three coating stations, the demonstration facility has 38 different coating variations which can be used to coat materials such as hot melt and dispersion adhesives, as well as silicones, in a single web pass.

### Adhesives for Food Contact Articles

A presentation entitled “**Adhesives for Food Contact Articles – Future European Regulations**” was delivered by **Hermann Onusseit of Henkel KGaA (Germany)**, who highlighted the hot topic of food contact materials and the corresponding European legislation for components such as printing inks and adhesives. Food contact packaging should not influence the foodstuffs with which it comes into contact during processing, transport or warehousing—changing neither the toxicology, composition, nor the properties thereof.

Mr. Onusseit emphasised that the only possible and useful way of regulating the industry on behalf of consumers is through a specific testing concept using a combination of extraction and migration tests along with mathematical modelling. This will guarantee the safe use of inks and adhesives in multilayer food contact materials, and the system can be utilised cost-effectively by the industry, especially SMEs.

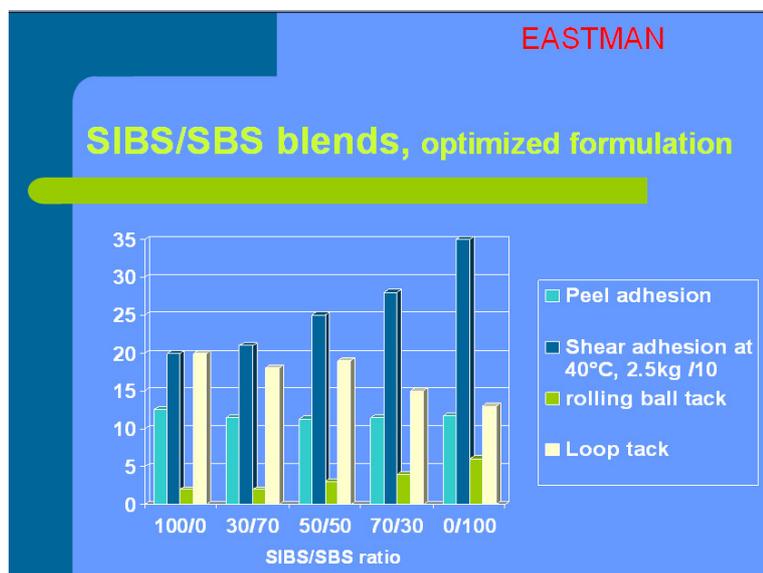
### Hot Melt Tape Formulations

One of the most popular presentations of the TS was made by **Chrétien Donker of Eastman Chemical BV (Netherlands)**. Feedback indicated that Mr. Donker discussed “**A New Generation of Hot Melt Tape Formulations, Using Blends of SIBS and SBS Block Copolymers and New Hydrocarbon Tackifying Resins**” in a dynamic, coherent fashion. Adhesive formulators are looking for alternative polymer systems due to the impact of isoprene availability on the supply of SIS (styrene-isoprene-styrene) block copolymers, which are an essential part of most HMPSA formulations.

According to Mr. Donker, blends of SIBS and SBS block copolymers can be prepared with up to 50% of SBS, provided the right type of tackifying resin is used. A good starting formulation for a 50/50 blend of SIBS and SBS block copolymer contains 125 phr of resin and 25 phr of oil. The formulation can be further optimised according to the desired adhesive performance. Mr. Donker showed that in the experimental set-up, using Z-blade mixers and relatively short residence times, both SIBS and SBS were easily processed. Also in a laboratory scale twin-screw extruder, the adhesives were easy to mix and gave no signs of gelling or other processing problems.

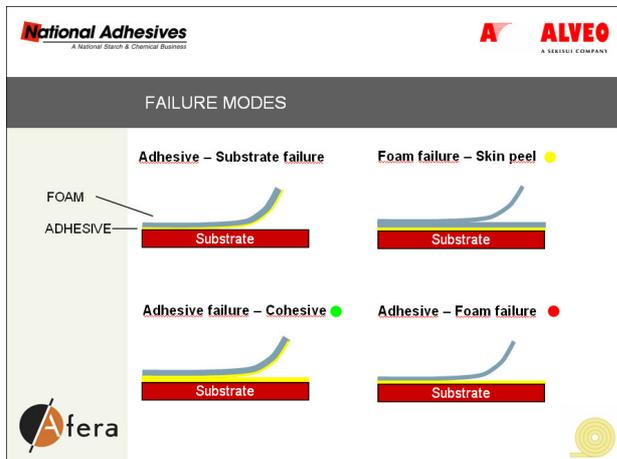
### PSA Foam Tape Design

Immediately following Mr. Donker’s presentation was another extremely highly-rated lecture given by **Frank Voermans of Alveo AG (Switzerland)**, co-authored by **Kerstin van Wijk of National Adhesives (Netherlands)**, entitled “**Progress Toward Understanding PSA Tape Design**”. The presenter related that the performance properties of PSAs depend on several parameters: not only the type of the adhesive and the carrier material, but the thickness of the carrier, the adhesive coat weight and the interaction between the



carrier material and adhesive.

Mr. Voermans described the influence of the different carrier materials, in particular crosslinked polyolefin foams and acrylic PSAs on the final properties and performance of the tape. The investigation of the mechanical and chemical properties of the carrier material, the adhesive properties and the final tape should enable development of a model which makes the properties of a tape more predictable. The presenter related that current research at National Adhesives (an adhesives manufacturer) and Alveo (a manufacturer of crosslinked polyolefin foams) includes material characterisation by determining conformability, compression modulus, hardness and functionality of the carrier materials, rheological data, peel, shear and functionality of



the adhesive and performance properties of the final (foam-) tape.

### Convection Drying for Coated Web Material

Last on the agenda for the TS was “**Innovative Convection Drying for Coated Web Material**”, a paper delivered by **Dirk Robeling of Herbert Olbrich GmbH & Co. (Germany)**. Mr. Robeling described how dryers are still relevant to the hot melt adhesive production process, as organic solvent agents or water are still required for the coating process and must evaporate from the product in an economical manner.

Olbrich has developed a new dryer, lower air nozzles type CTS, for both efficient heat transfer and material transport at low tension in combination with the new switchable upper air nozzle, type TP. The presenter explained that these dryers have been designed to maximise the concentration of solvent agents in the exhaust air and to minimise the exhaust air volume for water-based formulations. Furthermore, the dryer can be operated as an idle roller dryer or as an air flotation dryer.

### Slides, Notes & Additional Info.

The **proceedings** of the 3<sup>rd</sup> TS programme were distributed in hardcopy to the participants at the event, and later the link to the corresponding digital slide presentations was sent to all event participants and Afera members via email: [www.afera.com/ts2006.html](http://www.afera.com/ts2006.html).

### Upcoming Technical Events

Next year’s Afera technical event will be the 3<sup>rd</sup> **Tape College**, a 2-day educational seminar held at the same venue in Brussels (see page 24). The 4<sup>th</sup> **Technical Seminar** is scheduled to take place in 2008.