

## **Bonds that last 粘接永久**

Novamelt GmbH is a family owned producer of hotmelt pressure sensitive adhesives (HMPSAs) with production sites in Germany and the US.

Novamelt 德国公司是一家在德国和美国都有生产基地的热熔压敏胶（HMPSAs）生产的家族企业。

Twenty years ago the founders saw the potential market growth in HMPSA due to economic and environmental reasons. At that time the market was predominantly using water based and solvent based PSAs. They could clearly see an opportunity to develop and build a dynamic new PSA business around 100% rubber and/or acrylic based PSA technology avoiding energy demands for drying and solvent recovery in coating processes. At that time there was no highly specialised adhesive company in the market that was focussing on this exciting opportunity. Applications of HMPSA require in most industrial areas technical input and expertise. The founders were convinced that the family owned business offers the best solution for developing products for exciting new market opportunities.

20 年前，我们的创始人团队发觉了热熔压敏胶市场的巨大市场潜力，由于成本和环保的因素。而在当时，市场基本被水胶和油胶所占领。他们敏感地发现了机会，并迅速开发了基于 100%橡胶型或者丙烯酸型的热熔胶，从而减低了在涂布过程中烘干和回收溶剂的能耗。此时，市场上还没有专业的胶粘剂生产商专注在这个令人兴奋的领域。热熔压敏胶的应用在众多领域都要求专业的技术服务和经验。创始人团队坚信只有家族型企业才能为这个新兴的市场提供最好的解决方案和产品。

Now, twenty yeas later it proved to be the right decision. After 20 years in business with ten years of own production Novamelt is one of the key players in the HMPSA business worldwide with the headquarter in Wehr in southern Germany near the border to Switzerland. Having tremendous success in Europe the company was encouraged to invest in a brand new HMPSA production and lab facility in the US in 2006. The investment in the US was supported by the German family owned adhesive producer Jowat AG, located in the northern part of Germany, which already had a facility in High Point, North Carolina. The new company is named Novamelt-Jowat LLC, indicating that Novamelt holds a majority in shares. With production facilities in the Euro and Dollar area Novamelt is well prepared to meet the customer needs globally.

现如今，20 多年来的事实证明了他的当初的正确决策。经过 20 多年的运作，和 10 多年的自行生产，Novamelt 已经成为全球热熔压敏胶的主要供应商之一。全球总部在德国南部的 Wehr，靠近瑞士。由于在欧洲市场的显著成功，公司在 2006 在美国投资建设了新的工厂和实验室。在美国的投资与德国另一个家族胶粘剂生产商 Jowat AG 共同进行，他们位于德国的北部，在美国北加州的 High Point 已经有了工厂。由于 Novamelt 占有大部分股份，新的工厂被命名为 Novamelt-Jowat LLC。在欧元和美元区都建立了工厂和实验室，这使得 Novamelt 可以在全球更好地服务客户。

Main markets for Novamelt are adhesives for label stock, speciality tapes, medical products, building and automotive industry as well as for product assembly. In the label area we offer solutions for every kind of application either using rubber based HMPSAs or UV-Acrylic based HMPSAs.

Novamelt 的主要市场是：标签、特种胶带、医疗用品、建筑和汽车生产行业。在标签行业我们提供全面的解决方案，无论是使用橡胶型或者 UV 固化丙烯酸型热熔压敏胶。

The core range covers adhesives for labelling at room temperature to card board or shampoo and beer bottles as well as adhesive for labelling cold and humid food packaging (low energy surface packaging materials) at around freezing point. There are also solutions available for the labelling of frozen food at -25°C and the labelling of tyres.

核心技术包括在室温下纸盒、沐浴露等香波、啤酒瓶的贴标，或者用于冷而潮湿的食品贴标（低表面能包装材料），在冰点环境下。针对冷冻食品-25°C 贴标，和轮胎标签，我们也有解决方案。

In the technical part I want to focus on different solutions for “No-Label-Look”-Labels, wash off and wet wipe applications.

在技术方面，我将重点介绍针对“无标签感”“可水洗和湿移除的水晶标”。

There are different adhesive technologies in the market that can be used for label stock: Acrylic dispersions, solvent acrylic, solvent rubber, rubber based hot melt and UV-Acrylic HMPSAs. All these technologies have their advantages and disadvantages which are shown in the following graph, where the key advantages of rubber based HMPSAs and UV-Acrylic based HMPSA are highlighted:

市场上有多种胶粘剂可应用在标签行业：水性丙烯酸型、溶剂丙烯酸型、溶剂橡胶型、橡胶型或 UV 固化丙烯酸型热熔压敏胶。所有这些技术在以下的图示中可以看到，都有优缺点。橡胶型和 UV 固化型被标出。

For rubber based HMPSA the key advantages are a very broad adjustable adhesion profile, very good adhesion to polar, non polar and humid surfaces, high resistance to water and moisture and comparatively low adhesive cost. Also the investment for coating equipment is comparatively low as you do not need huge drying ovens and therefore less space in the production building.

对于橡胶型热熔压敏胶，其显著的特点是其粘性有很宽的可控范围。对极性、非极性、潮湿表面都有很好的粘性，抗水和湿气，和总体的较低胶粘成本。同时其涂布设备成本也较低，不要大型的烘箱，也可以节省空间。

For UV-Acrylic based HMPSA the key advantages are very good adhesion to polar and non polar surfaces, a very good high temperature and chemical resistance. Also die cutting and matrix stripping properties are excellent. The investment cost for coating equipment is slightly higher than for rubber based adhesives as you need UV-lamps.

对于 UV 固化型热熔压敏胶，其显著优势是对极性或非极性的表面都有很好的粘附力，耐高温和化学品。其模切和排废性能也非常出色。其涂布设备成本比普通橡胶型要高一些，因为 UV 灯的使用。

Properties 特性	Acrylic dispersion 水性丙烯酸胶	Solvent Acrylic 溶剂型丙烯酸胶	Rubber based HMPA 橡胶型热熔压敏胶	UV-Acrylic based HMPA UV 固化丙烯酸型压敏胶
adjustable adhesion profile 粘性可调节性	++	+++	+++	++
Adhesion to polar surfaces 在极性表面粘性	+++	+++	+++	+++
Adhesion to non polar surfaces 在非极性表面粘性	++	++	+++	+++
Adhesion to non polar humid surfaces 在潮湿的非极性表面	+	+++	+++	++
Shear strength 剪切强度	++	++++	+	++
Temperature resistance 耐高温性	+++	++++	++	+++
Die cutting properties 模切性能	+++	+++	++	+++
Water and moisture resistance 耐水和潮湿性	+	++	+++	++
Investment cost for coating equipment 涂布设备投资成本	+++	++++	+	+
Adhesive Cost 胶粘剂成本	+	+++	+	+++

+ = low  
 ++ = medium  
 +++ = high  
 ++++ = very high

Due to the low investment cost for coating equipment for rubber based HMPSA or UV-HMPSA it makes sense to use these technologies for an in house “No-Label-Look” production for a printer using reverse printing technology. In addition to that the coating equipment can be integrated in an existing printing press.

由于橡胶型和 UV 固化型热熔压敏胶的涂布设备成本较低，帮助印刷厂使用反向工艺自行生产“无标签感”水晶标。另外涂布设备也可以与现有印刷机集成。

### No-Label-Look/无标签感

Main requirements for NLL adhesives are a high transparency and sufficient chemical resistance against the ingredients of the labelled packaging. In addition to that a high UV-stability is necessary in order to prevent the yellowing of the adhesive and therefore the yellowing of the label. It is obvious that the adhesion to low energy surface materials has to be good in order to prevent the label from falling off. Another necessity are good converting properties such as die cutting, matrix stripping and the suitability of the adhesive for high speed labelling.

对于水晶标的胶粘剂主要要求是高度透明，和足够的耐化学性来应对瓶内的不同化学成分。另外耐 UV 的特性也是必须的，来防止由于胶发黄而使得标签发黄。在低表面能表面必须有良好的粘性也防止脱落。另外满足工艺性能也是必要的，比如模切、排废、和满足高速贴标要求。

Protective film/覆膜
Laminating adhesive/覆膜胶
Printing ink/印刷油墨
OPP film/OPP 薄膜
Adhesive 胶
Filmic release liner/离型层

In a typical construction currently used for NLL the green section, which is the clear to clear laminate, has to be bought in by the label printer. Available clear to clear laminates are relatively expensive and the choice in terms of adhesion properties is limited.

The blue section describes the process steps that a printer has to perform: Printing on the laminate, application of a laminating adhesive and afterwards lamination with a protective film. This protective film has to

full fill three key tasks: Protecting the printing ink from scratching, improvement of chemical resistance and protection of the content of the bottle from interactions with the printing ink.

典型的现有水晶标结构如绿色图，是透明-透明不干胶材料，印刷厂必须购买这种材料。而这种材料的售价较高，而且胶粘性的选择性小。

蓝色图显示了印刷厂的工艺步骤：印刷、涂覆膜胶、覆膜。覆上的保护必须满足 3 个重要要求：防止印刷层被刮擦、提高耐化学性和防止瓶内成分与印刷油墨反应。

In the following construction the clear to clear laminate is produced by the label printer himself. The OPP film is reverse printed, coated with HMPSA or UV-HMPSA, and laminated with the release liner.

以下的结构的水晶标由印刷厂自行制造。OPP 的薄膜是印刷在反面的，然后涂有普通或 UV 固化热熔压敏胶，再与离型层复合。

The advantages in this construction are obvious: unlimited choice of adhesive (re-open able, re-positional or permanent), no need of laminating adhesive and protective film.

这种结构的优势是显而易见的：对胶的选择无局限（可打开、可再贴、或永久性），不需要覆膜胶和保护膜。

OPP-film /OPP 薄膜
Printing ink/印刷油墨
UV-curable Acrylic HMPSA UV 固化丙烯酸型热熔压敏胶
Filmic release liner 离型膜

With this construction it is possible to save up to 20% of material costs. But this is not the only advantage: The label printer will be more flexible in terms of lead times and batch sizes. Due to today's competition and cost driven market the label printers now have a unique opportunity to be one step ahead of their competition and therefore better securing their future business.

在这种结构下，可以节省最高 20% 的材料成本。但这不是唯一的优点：印刷厂在交货期和批次产量方面会有更好的灵活性。针对无所不在的竞争和成本压力，印刷厂会比竞争对手领先一步，更好的发展和巩固生意。

As indicated before it is possible to use either rubber based HMPSA or UV-Acrylic HMPSA to produce this construction. But when do you use which technology?

For high end NLL construction it is adequate to use UV-Acrylic HMPSA as there are certain advantages such as high chemical resistance and UV-resistance but of course there are also some disadvantages: comparatively higher adhesive cost and a slightly higher investment in the coating equipment because of the UV-lamps

Products to be used for NLL-Construction out of the Novamelt portfolio are summarized in the following table

如前所示，橡胶型或 UV 固化丙烯酸型都可以用来制造这种结构的产品。但是你何时采用何种技术呢？

对于高要求的水晶标结构适合采用 UV 固化型丙烯酸压敏胶，因为有以下优点，比如耐化学性和 UV。当然也有一些缺点：比如胶的成本会高，由于 UV 灯使用使得涂布设备成本变高。可应用在水晶标结构的 Novamelt 产品系列如下所示：

	<b>Rubber based HMPSA</b> 橡胶型热熔压敏胶		<b>UV-Acrylic HMPSA</b> UV 固化型热熔压敏胶	
	<b>Permanent</b> 永久性	<b>remove able</b> 可移除	<b>Permanent</b> 永久性	<b>remove able</b> 可移除
	Novamelt PS 1712	Novamelt PS 4010	Novarad RC 21151	Novarad RC 24110
180° peel to SS 180 度剥离 不锈钢板	22 N/inch	4 N/inch	11 N/inch	5 N/inch

Using these products you are able to offer individual customer solutions in terms of adhesive profile, adhesive technology and pricing.

使用这些产品，你可以给客户不同的方案，不同粘性、不同贴标技术、和不同成本。

For permanent applications you can use the rubber based adhesive Novamelt PS 1711 or the UV-acrylic based Novarad RC 21151. In terms of remove able adhesives there is the choice between the rubber based product Novamelt PS 4010 or the UV-acrylic adhesive Novarad RC 24110.

对于永久性应用，可以使用橡胶型的 Novamelt PS 1711 或者 UV 固化型的 Novamelt RC 21151.在可移除的胶中，可以选择橡胶型的 Novamelt PS 4010 或者 UV 固化型的 Novarad RC 24110。

### Wash off/水洗

Also wash off labels for beer bottles are a NLL construction. In this case the first adhesive choice is UV-Acrylic HMPSA because of its unique properties. Of course this construction does not only depend on the adhesive that is used, but also on the face material as it supports the wash off process. In this paper the focus will be on the adhesive.

可水洗的啤酒标也是水晶标结构。第一选择是 UV 固化丙烯酸型热熔压敏胶，由于其独特的特点。当然，这种结构不仅仅取决于所使用的胶，也取决于面材，这决定了可水性的工艺。在此，我们重点介绍胶粘剂。



Typical requirements for NLL wash off beer labels are high transparency, well balanced adhesion properties to assure wash off properties and an acceptable mandrel performance for labeling the bottle neck. Also very important is a sufficient cold water resistance and no water whitening of the adhesive in ice water.

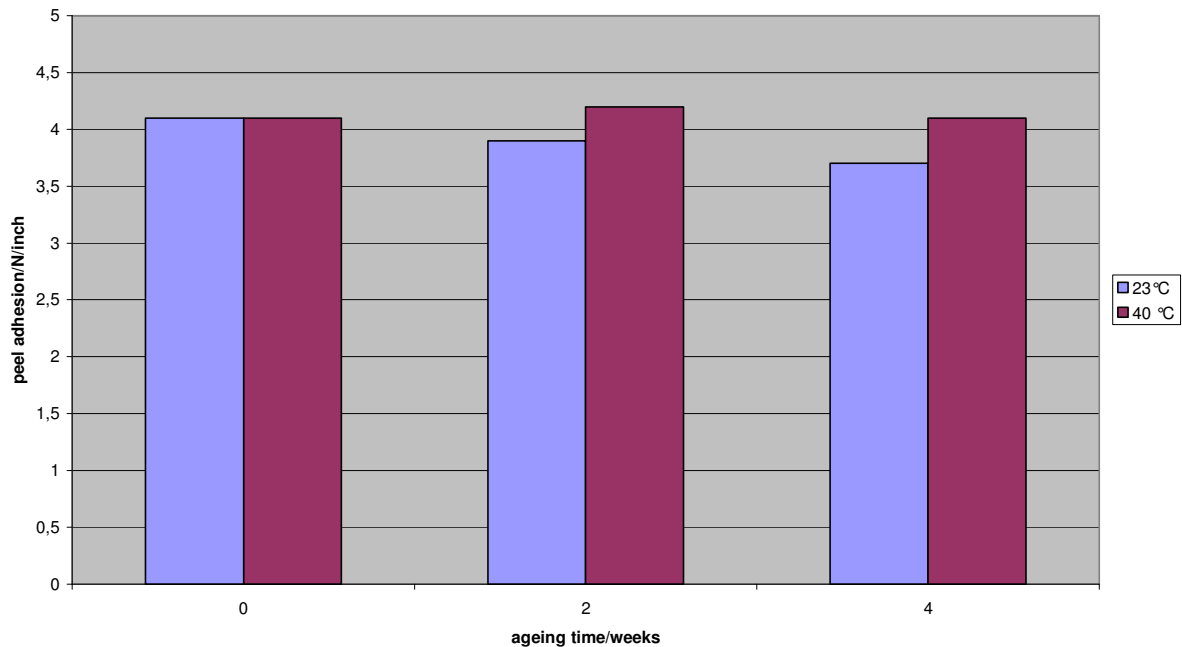
可水洗水晶标的典型要求是高度透明，和适度的粘性以保证可水洗。同时对酒瓶瓶口贴标也要求良好的贴合性。同时耐冷水和在冰水胶粘剂不发白也是非常重要的。

Usually the wash off process is done at 80°C in a caustic environment (2% NaOH) and an expected wash off time of two Minutes at the most.  
通常，水洗工艺是 80°C 的碱性环境中(2% NaOH)，最多 2 分钟。

As you can imagine there were a lot of factors that had to be taken into consideration while this adhesive has been developed  
你可以想象，在此之前很多的因素等必须被考虑，而胶必须满足这些条件。

The most important property is a consistent wash off time of the label also after being in the market for several weeks. This means that there is no adhesion build up to glass over time. As indicated in the chart below there is no significant increase in peel over four weeks ageing at ambient temperature and at 40°C. The ageing test was done with a 18gsm coating of RC 24110 to a 60µm BOPP. The samples were applied to glass plates under defined conditions as required to run a Finat FTM1 peel testing. For the ambient temperature ageing the specimen were placed in a drawer in an air conditioned room and for the 40°C ageing they were placed in an oven.  
最重要的特性是保证标签稳定的水洗时间，在商品上柜几个星期内。这意味着，长时间存放后，胶不能在玻璃表面堆积。如图所示，在常温和 40°C 老化 4 个星期后，剥离力无明显增加。测试条件是 18 克/平米的 RC 24110 涂布在 60µm BOPP 薄膜上。样品贴合在玻璃板表面，在 Finat FTM1 剥离测试的标准条件下。室温条件下是存放在空调房间的抽屉内，而 40°C 老化则是放在烘箱内。

Ageing of Novarad RC 24110 on glass at 23°C and 40°C



## Wet Wipe closures/湿纸巾关闭胶



For an adhesive usable for wet wipe closures there are several requirements for the adhesive. Besides a very soft opening the packaging has also to be closed and re-opened again for several times. Due to the chemically aggressive ingredients for example in household wipes for sanitary areas the chemical resistance of the adhesive has to be excellent. Also the resistance to oil has to be superior as baby wipes contain a lot of it. In addition to that the adhesive has to work even when contaminated with the ingredients of the wet wipe. These challenging requirements can be met by UV-curable acrylic HMPSAs.

As there are different packaging materials on the market and as there are slightly different requirements

from different customers we have developed a range of UV-curable acrylic adhesives for this demanding application.

对于湿纸巾关闭胶有一些特殊的要求。除了要求非常轻柔的打开，还要保证数次打开和再粘合。由于湿巾化学成分较强，比如卫生间使用的消毒湿巾，要求胶有出色的耐化学性。同时也要求耐油性，婴儿用的湿巾含有大量的油。另外当胶被湿巾内化学成分污染后，仍然要求有适合的工作性能。UV固化的热熔压敏胶可以满足这些挑战。由于市场上不同的包装材料，和不同客户的不同要求，我们开发了一系列的UV固化丙烯酸热熔压敏胶来满足这些苛刻的应用。

cured at 10m/min 190W/cm H-Bulb 10 米/分钟 固化 190W/cm H 灯管	Unit	Novarad RC 24360	Novarad RC 24365	Novarad RC 24370
<b>Adhesion properties (20gsm to OPP)</b> 粘着性 (20 克/平米 涂布在 OPP 膜上)				
180° peel to PET film	N/inch	3,8	2,1	1,6
180° peel to soft touch film 柔软触感薄膜	N/inch	3,8	2,3	1,5
180° peel to <b>BDF film</b> <b>Barrier Display Film?</b>	N/inch	3,8	1,9	1,3
SAFT (0,5°C/min; 0,5kg) Shear Adhesion Failure Temperature 剪切破坏温度	°C	142	130	86
<b>Open/closure behaviour</b> 开/合性能				
to PET film		zippy/noisy 嗒嗒/噪音	Soft 柔软	very soft 非常柔软
to soft touch film		zippy/noisy 嗒嗒/噪音	Soft 柔软	very soft 非常柔软
<b>to BDF film</b>		zippy/noisy 嗒嗒/噪音	Soft 柔软	very soft 非常柔软

The differences of these three adhesives are the peel values and the opening behaviour to the different packaging films.

以上 3 中胶的区别在于在不同包装薄膜上不同剥离力和开合性能。

Using one of the above mentioned adhesives you are able to create customer specific solutions on each available packaging film. For high adhesion there is Novarad RC 24360, for medium adhesion and softness there is Novarad RC 24365 and for low adhesion and very soft opening there is Novarad RC 24370.

使用以上胶粘剂中的一种，你可以针对不同包装薄膜设计客户解决方案。对于高粘性，可以选择 Novarad RC 24360，而对中等粘性到柔软的开合，可以选择 Novarad RC 24365，对于低粘性和非常柔软的开合，可以用 Novarad RC 24370。

### Outlook/展望

One of the most important questions for all of us is: How will the future of the label market look like?

对于我们所有人而言，最重要的问题之一是：未来的标签市场发展会如何？

In the time of an economic crises in most parts of the world we observe that the market offers more and more space for individual customer solutions.

在全球大部分地区经历金融危机的年代，我们看到对不同客户提供针对性的解决方案要求越来越多。

We see the products and applications presented today as an excellent means to strengthen your market position and to secure your future business. In addition to that this technique helps you to differentiate from your competition and to create added value. You will be able to supply your customers with individual solutions, and what is even more important, you create “Bonds that last”

我们看到今天所展示的产品和应用，可以帮助你巩固市场地位，和维护未来的业务发展。另外这个技术帮助你从竞争对手中脱颖而出，从而实现增值。可以为不同的可以提供定制的方案，另外更重要的是你创造了“粘接永久”。