



THE pressure-sensitive adhesives (PSA) industry is under enormous cost pressure. Nikolaus Trippen from Wacker Silicones discusses how silicones producers can help solve the cost problem

Silicones were first used for release liners in the 1950s. Initially, only solvent-based condensation-curing systems were available. They were joined in the 1960s by solvent-based addition-curing silicones and then in the 1970s by a solventfree counterpart. The latter rapidly established itself in the release liner market and continues to dominate to this day – with nearly 80 percent of the market. This market is now mature, and strong cost pressures are beginning to emerge in certain segments.

Self-adhesive applications account for more than 90 percent of global output of release liners, most of which go into label stock production. The intense cost pressure in the market for self-adhesive labels is squeezing labelstock makers from two sides. On one side are the end-customers, trying to maintain low prices. They enjoy some leverage because PSA label users can switch to cost-effective alternatives in product decoration technologies – for example in-mold labels.

On the other side are the prices of raw materials, which have soared in recent years and are trimming the label-stock makers' profit margins. In an effort to remain profitable in this environment, makers of release liners and laminates are seeking ways to cut costs.

GOAL: LOW TOTAL COSTS

The bind in which the PSA industry finds itself extends to silicone manufacturers. This has prompted Wacker Silicones, in cooperation with key customers, to analyze the cost structure of label stock production. Base liner, adhesive and facestock prove to be far and away the three largest cost factors in this value-added chain, each accounting on average for nearly 25 percent of the total cost. However, these costs fluctuate enormously with their constituent materials. The silicone systems account for approximately 5 percent, while production, administrative and distribution costs together form about 20 percent.

Clearly, then, silicone is a comparatively low cost driver. But its influence on the performance of the entire label stock is critical. When decisions have to be taken as to which silicone system to use, it becomes clear how heavily dependent the individual process steps and the raw materials are on each other – and just how difficult it is to strike the right balance of components. That said, though, this very relationship can serve as an effective tool for cutting costs.

The place to start looking for savings is the major cost drivers, such as the quality of the base liner, the quantity or quality of the adhesive, and the facestock thickness. The only way to realize savings potentials in these areas is to have a properly

balanced silicone system. In other words, the correct choice of silicone is the key in reducing the cost of the total product.

This is the idea underpinning the 'Low Total Cost Concept' devised by Wacker Silicones. It identifies twelve areas in the fields of raw materials and processes where silicone manufacturers could help their customers cut overall costs. There has been a related shift in the focus of development work in recent years. While previously the goal was to make the impossible possible, nowadays it is to render the feasible more efficient. For example, the fastest coating machines commonly in use can process more than 1,000 meters per minute. The only way to attain such high speeds – without detriment to the quality of the laminate – is to optimize the flow properties of the silicone system and effectively prevent the formation of spray mist. The supplier has to develop an appropriate silicone chemistry that answers these new requirements. This enables customers to slash the fixed costs per square meter of liner by doubling the coating speed.

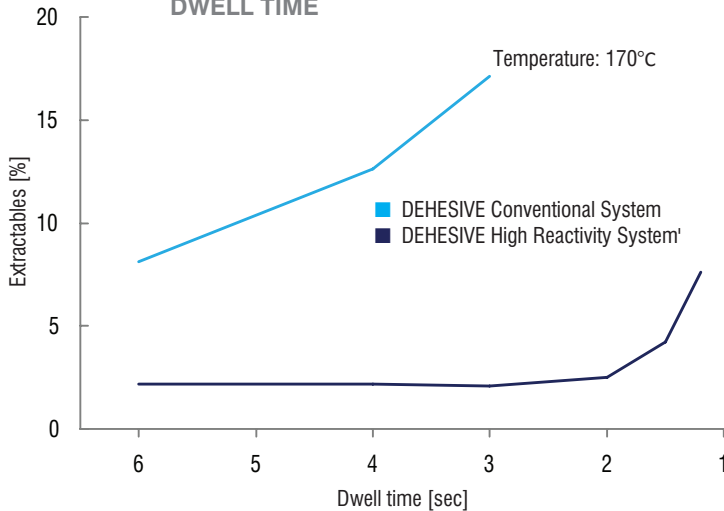
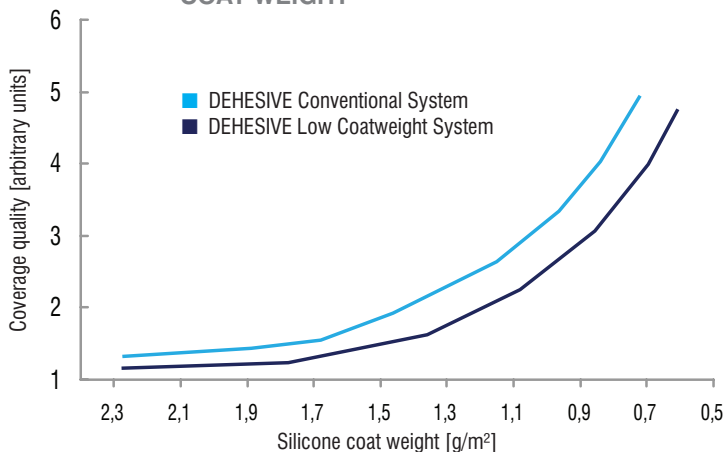
ECONOMIZING ON THE SILICONE SYSTEM?

The silicone share of the total cost is determined chiefly by the thickness of the silicone release coat and by the platinum content, providing the system is the platinum-catalyzed addition-curing type, which is usually the case.

In classic silicone systems, the platinum content is about 100 parts per million (ppm), and so 1 kilogram of the blended silicone system contains 0.1 grams of platinum. The use of highly reactive specialty silicone systems can cut the platinum content down to 30 ppm (Figure 1). Assuming an annual production of 200 million square meters release liner and taking the current platinum price of over 40 euro/gram as our basis, this clearly translates to savings of above half-million euros per year.

However, it must be remembered that lowering the platinum content increases the risk of incomplete curing. While cost considerations make it favorable to introduce low-platinum systems nowadays, expert technical advice from the silicone supplier remains essential.

Reducing the silicone layer thickness can have even greater effect on costs than lowering the platinum content. A 20 percent reduction in coat weight yields the same savings as a two-thirds reduction in platinum costs and can be achieved with specialty novel silicone systems, without detriment to coverage of the substrate surface (Figure 2). Also for coatweight reduction, a deep understanding of the product by the silicone supplier is crucial as the coat weight may also influence the release

FIGURE 1: EXTRACTABLES AS A FUNCTION OF DWELL TIME**FIGURE 2: COVERAGE AS A FUNCTION OF SILICONE COAT WEIGHT**

performance. In any case, a margin of safety should be always incorporated to prevent the quality of the entire laminate from being jeopardized.

REDUCING SUBSTRATE COST

The largest cost in the value chain is usually the uncoated base liner. Using a lower cost base liner can therefore be an effective way to reduce the total cost. The savings accruing from paying 20 percent less for the base liner are often equivalent to 100 percent of the silicone cost.

For paper substrates, the two ways to start lowering costs are to use thinner base liner and more economic paper grades. This means, though, if glassine paper is to be replaced by a less calendered paper grade, the silicone must provide excellent coverage and the lowest penetration into the paper.

There are silicone emulsions and specialty high-viscosity, solventless silicone systems available that provide such good coverage on more porous paper grades. In some cases, it is best to coat such economic paper with a highly reactive silicone system at a reduced oven temperature, as that will prevent excessive heat stress on the paper and the need for remoisturization. This is an instance in which a highly reactive system is being used not to lower the platinum content, but to lower the substrate costs – and magnify the savings effect.

LABELS & LABELING

The siliconizing of film depends critically on the adhesion between the substrate and the silicone. Indeed, poor adhesion is the main reason that more expensive, primed films are used at all. New, solventless silicone polymers are now available that provide good anchorage and a smooth silicone release coat even on the much cheaper, untreated films.

REDUCING PROCESSING COSTS

Process costs, too, usually exceed the silicone costs. There are various ways for silicone manufacturers to help savings be made. These include developing silicone systems that are conducive to higher coating speeds, easier handling, reduced VOC emissions, and lower energy demand.

In particular, increases in coating speed are hampered by the formation of spray mist. Wacker Silicones offers an on-site service – at the customer's coating plant – for evaluating spray mist problems. Trials of newly developed anti-misting additives and highly reactive silicone systems show that speeds of up to 1,600 meters per minute can be achieved on the newest generation of coating machines (Figure 3).

But silicone users can also conserve resources by taking advantage of a comprehensive package of supplier's technical service and close technical cooperation. This type of intensive, all-around product-service is the most efficient way to arrive at the necessary selection of components and their right mix ratio in the customized silicone formulation.

CONCLUSION AND PERSPECTIVES

Silicone systems are not commodities. Their highly diverse product characteristics and the quality of services provided afford scope for differentiation. To be sure, price is important when a silicone system is being purchased, but it is not the only criterion, as the examples illustrate.

The silicone system determines the functionality and performance of the label stock. Choosing a silicone system that is customized to all the raw materials used and to the process chain can slash the total cost of the laminate. The silicone system therefore is key to solving the cost problems of the PSA industry. To realize future savings potentials, a customer ought to partner with a silicone supplier they feel offers reliable, innovative and economically sound products. However this is sometimes not enough. These must be combined with competent technical service, based upon a deep understanding regarding the requirements of following production steps and ultimately the finished product.

FIGURE 3: MISTING LEVEL AS A FUNCTION OF COATING SPEED