

Mustard cups - soft automation

35 million units per year with Waldorf Technik

Mustard is very popular here and abroad – used as a condiment for the popular fried sausage as well as a delicate ingredient for a mustard sauce for fine meat. The Romans brought the recipe for making table mustard to Germania. The name, however, is probably older and dates back to Egyptian origin. In the course of history mustard has been served in many different types of packaging: in a jug, in a glass as well as a tube. Now it is time for the delicate condiment to get popular in an up-to-date type of packaging. Handy, user friendly cups, as well known from yoghurts, will bring a breath of fresh air into the shelves very soon. What cannot be over looked is the small revolution during their production process: the label material paper is combined for the first time in one cycle run in 8 cavities with the most thin walled plastic – 35 million units per year with clearly better performance!

The task - sophisticated

To create something special takes a long time ... and so a long journey began in 2006 as Weidenhammer Plastic Packaging, Waldorf Technik, KEBO and Demag joined together when Develey Senf & Feinkost GmbH knocked at their doors. Develey is known as the biggest German mustard manufacturer with a market share of 30%. Founded by Johann Conrad Develey in 1845 and appointed in 1874 to a supplier to the Royal Bavarian Court. Develey took over the delicatessen brand Specht in 1968 and has been supplying to the Fast Food giant McDonald's since 1972. The Saxon Bautz'ner Mustard was added to the Develey Group in 1992. For 35 million mustard cup units, produced on the existing 10 year old system per year, the time had come to look for a new solution. "Upgrade and lightness" was the concept worked out by Weidenhammer Plastic Packaging for the customer. Thanks to an extremely thin walled Polypropylene cup with paper label, a total of 2 grams could be saved – this is a very important factor for the customer with respect to the additional costs arising through the DSD recycling system in Germany. These costs needed to be eliminated! The savings in comparison to the investment volume of 650.000 Euro proved to be as convincing during the final negotiation stage just as Weidenhammer's competence. Maurizio Conte, Weidenhammer Plastic Packaging's Operations Manager, admits that he is proud to have achieved the result of this difficult project. The system proves that, above all, the right partners were chosen who guarantee a care free handling of this project through performance, speed and know-how as well as a perfect collaboration between each other. "The Kick Off Meeting, a get-together with all partners in the beginning was, at the same time, an emotional brainstorming among experts which enabled them to filter out the best solutions" he explains and is certain that "this PP + P packaging project, a light Polypropylene cup with paper label, will have a signal effect on the market." Next to the cost savings of recycling fees to the DSD, the use of a paper label in comparison to a plastic label reduces the costs by further 10 to 15 %. For Weidenhammer, the specialist for plastic packaging, however, the cost savings are not the most important factor. The Operations Manager emphasises that it is more important to have created a replacement investment for the customer that shows innovative marketing opportunities and is in use for more than ten years in relation to a low start up price.

All responsible partners in this project agreed on the fact that the technical challenge was extremely difficult as all components – tool, machine, label and automation – have to work together in perfect harmony.

The tool – 8 cavities and precise

The tool is designed and manufactured by KEBO, Neuhausen, Switzerland, who entered the challenge with the aim to maintain the cycle time of the system predecessor even though the tool was clearly smaller and also did not feature the insertion of a label. As the paper material is playing a decisive role, KEBO's project manager Thomas Fehr and his team had to keep to the extreme accuracy of one μm . The required eight cavities formed a further challenge. Despite the extensive experience, that Fehr had already collected during another paper project, the Develey project required further tests as well as the adjustment to the TE closure (temper evidence sealing ring) until the perfect tool design could be finalised.

„The concept to reduce the wall thickness massively to just only 0.39 mm including label with a tolerance of +/- 2% demands on maximum injection regularity”, explains the project manager. “Especially as the cup is injected from the base – the cup base measures 0.42 mm – and the complete cup ring with its grooves must be filled equally at the top too, that forms a challenge with eight cavities!” This can only be achieved with an absolutely optimised hot runner.

„The holding function for the paper inside the tool created a further difficulty”, adds Fehr. “Try to load paper statically charged ...” Thin vacuum channels are responsible for the label being placed ideally inside the tool. Furthermore, the quality, fibre direction, etc. of the used paper proved to be decisive factors.

The injection moulding machine – rigid and fast

The EL-EXIS S 350/810 – 1450 from Demag was chosen as the injection moulding machine for this project. The reputation on one hand and the price / performance relationship on the other hand formed the decision. The improved control and speed of this machine generation as well as its sturdiness (no additional stabilisation required) added to its advantages.

The hidden problems with the change from plastic to paper were highlighted from Demag's Vice President Packaging, Willem Veerman. “The combination with the paper label influences heavily the partnership of tool and machine. It influences parameters such as injection speed and pressure. The expectations from the machine exceed the usual standard with such a project.” Standard already means very impressive figures as e.g. an injection speed of 1,000 mm per second, injection pressures of 2,000 bar specifically and a process consistency of plus/minus 0.05 percent. Finer details for both machine and tool were specified after the clamping force, 350 tons for the Develey system, was calculated. A medium sized injection unit is used for this project. “It goes without saying that the customer ensures the constant thermal conditions for the system environment and that the machine remains standing always at the same place”, adds Veerman. A change in conditions would cause the wear of the guide bars and finally of the tool itself.

The Automation – in harmony with the cycle

In contrary to tool and machine the robot and the machine are not connected with each other but self contained units. Wolfgang Czizegg, CEO of Waldorf Technik, emphasises the importance of precision of the inserted label. "If the label is not placed accurately, the interface might no longer be correct", he explains. "Collisions and inaccuracies would follow". The Waldorf system guarantees a position accuracy of plus/minus 0.2 mm. This times eight as the robot is equipped with eight dummy cores. The label is sucked with specific vacuum grooves to the dummy core before the arm with the dummy cores moves inside the tool. The opening distance is calculated at three times the cup height plus the size of the handling arm. Despite the increased number of cavities, the label insertion as well as the robot moving time, the cycle time of the predecessor system could be achieved. "A sporty result", resumes Czizegg satisfied. As the robot is working with two magazine levels, a design change is possible without any stop. The system inserts the eight labels as a full wrap during removal of the finished parts. The horizontally placed two times four cups are simply stacked after removal as the filling takes place externally. It is left to the customer to decide in which packaging sizes the cups are packed into bags and carton packaging. "The target was the already mentioned smallest possible influence on the cycle time" explains W. Czizegg. "The whole process inside the tool, from labelling to removal, requires no longer than 1.5 seconds – a very good result." It goes without saying that the system possesses a safety mechanism, which controls that all cores receive their labels. Should this not be the case, i.e. if there is no vacuum at one or more core stations, the process control receives a negative signal.

An advantage for the customer which should not be underestimated is the possibility to manufacture every other IML product (In Mould Labelling) up to approximately one liter on this system if required. Further, there is the possibility, too, to use Polypropylene labels on this system instead, as though paper does not possess the same ionisation problems corresponding provisions for the use of PP labels have already been installed.

Hygiene is a very important issue for the Develey project. This is Cleanroom production. The air pressure must be oil free, hands are constantly disinfected, dust free working is a priority. The finished labelled cups leave the machine in a clean and cool condition after a manufacturing temperature of over 240 degrees C and are moved straight away over the robot system on to a conveyor belt direct into bags and cartons.

The stacking process reveals that the product does not create a vacuum nor sticks together. At this stage the product design with a simple taper must be praised. The cup is not too narrow and the roughness of the paper prevents sticking. The label does not surround the cup for the total 360 degrees but leaves a gap for showing the content height; this causes further ventilation between the cups. All these factors enable an effortless de-stacking and simple handling of the new cup.

This new product that looks so simple at first sight presents a small sensation for the plastic market though. Despite the reduced wall thickness the cup exceeds its predecessors in rigidity or stability. The developed tool is a specimen that cannot be found anywhere else in the world. Where else can you find such a working together

of plastic and paper, so fast, precise and constant in its manufacturing process and this with eight cavities? The creative quadruplet - Weidenhammer Plastic Packaging, KEBO, Demag and Waldorf Technik – look forward to further opportunities that might arise following the design of this innovation.

Photos:

- 1 - mustard cup automation system
- 2 - mustard cup in the Kuriositäten-Restaurant „Da Guido“, Wetterauer-Straße 7, D-61352 Ober-Erlenbach Germany, Tel.: +49- (0)6172-49 45 08

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