

A new machine improves work safety with compressed hops

BREAKING UP IS HARD TO DO | Whole hops are enjoying increased popularity in breweries. They are packaged in vacupacks or so-called “hop bricks”, both of which are characterized by a high degree of compression as well as the exclusion of air. For the brewer, using vacupacks in the brewhouse is not so simple, since they have to be broken into pieces to measure out the hop additions. This is usually accomplished with a hammer, a chisel or a saw – a method requiring strength and effort – not to mention occupational safety risks.

WHOLE HOPS packaged in 5 kg vacupacks are used at the German brewer Alpirsbacher Klosterbräu Glauner GmbH & Co. KG. The highest product quality should be ensured through correct storage of whole hops in vacupacks. Alpirsbacher has taken the degree of compactness into account when reviewing the sustainability aspect of this product: the higher the level of compression, the smaller the space needed in the hop cellar to store a year’s worth of hops, reducing the amount of energy consumed and space occupied. Furthermore, packaging whole hops under a vacuum prevents a loss in quality due to oxidation. All in all, this is a solution which promotes sustainability and preserves product quality.

■ Handling problems

Until now, handling hops packaged in this way has been rather difficult, since the 5 kg block of pressed and vacuum-packed hops must be manually separated in order to add the hops to the wort kettle. If this is not done prior to the addition, sufficient contact between the wort and hops as well as the transfer of hop components to the wort cannot be ensured. This, in turn, leads to solubility problems and unsatisfactory hop utilization.

Due to the absence of a machine designed to carry out this function, brewers are forced to use mechanical means, such as saws, hammer or picks, to break the hops apart. This does not produce uniform or consistent results. Normally, larger clumps are left which are carried to the surface of the wort and remain there. Recirculation is employed to pull the clumps below the surface in order to better saturate the hops with wort and to allow the hop compounds to go into solution. This process achieves the purpose but is quite time-consuming.

■ Pilot system with rotating blades

Dillenburger & Hertel GmbH, an engineering office located in Freising, Germany, was confronted with this problem. They began their search for an uncomplicated, reproducible and reliable solution. They found a competent partner in Banke Process Solutions which designs and develops machinery based on individual concepts. A pilot prototype was delivered at the beginning of December 2014.

The pilot prototype consists of a table for unpacking the 5 kg hop bricks. Here, the

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Fig. 1
Table for removing the packaging from the hop bricks



packaging is removed and the hop brick prepared. The lid to the chamber is opened and the brick is inserted through the opening into the chamber. The brick is guided with a pneumatic cylinder onto a rotating set of blades. From there, hop cones separated from the brick fall through a funnel into a bucket placed below. The container used for the hop addition can then be filled from this bucket.

Processing a 5 kg vacupack only takes two to three minutes. The dispersed hops can be transferred from the bucket to the container used for hop addition while the next brick is being processed.

A fully automatic cylinder positions and guides the hop brick precisely and rapidly to the blades. The size of the hop pieces can be modified by adjusting the setting of the opposing blade. The blades are arranged in a spiral on a rotating shaft to ensure a uniform disintegration of the hop brick at the edge being cut.

The machine can be cleaned easily with compressed air. Since compressed air is already integrated into the machine for activation of the pneumatic cylinder. Thus, no additional fittings are necessary.

■ Improved work safety

The following occupational safety aspects are of particular importance:

- Potentially dangerous tools such as saws, hammer, picks or other items used for mechanical separation are no longer necessary.
- The only possible source of injury is the carpet cutter on the table which is used to open the vacupacks, though the risk of injury can be reduced to a minimum when using the appropriate tools and safety equipment.
- The machine is equipped with various safety features, which preclude the risk of injury, if the machine is used correctly. The following features are the most important:
 - the funnel has a guard welded to the middle section to prevent anyone from reaching inside;
 - the lid to the chamber is secured by a locking safety mechanism and can withstand 150kg of force if someone attempts to open it when the lock is engaged;
 - the lid to the chamber can only be opened with two hands (the button must be depressed while opening);
 - the lid to the chamber can only



Fig. 2 Hop brick in the chamber

be opened after the motor has been switched off and is motionless for several seconds. Once the motor has reached its final position, the lid can be opened with the pneumatic cylinder; – the machine can only be started after the lid has been closed and the emergency stop button has been pressed again.

- The exterior of the shaft with the spiral blade arrangement is secured with hard plastic discs so that no items or body parts can be pulled into the machine during operation.

■ Time savings and product safety

With this device, brewhouse staff must no longer spend time manually breaking the hop bricks into pieces. They only need to unwrap the bricks, and put them into the machine. Once the machine is finished, they

then place the hops into the equipment used for the hop addition. Depending on the time spent manually separating hop bricks in the conventional way, several minutes of work time per batch can easily be saved during regular operations. Even figuring a smaller savings in time, with hops in 5 kg vacupacks and a consumption rate of 30 tons of whole hops per year, cost savings are rapidly realized. An amortization time of one to three years is possible depending on the features selected for the machine.

As the hops flake off, they do so at a uniform and constant particle size, which not only ensures that the quality of the wort is good but also improves hop utilization. The hop fibers have more contact with the wort and the solubility is better, which also significantly increases the effective surface area for the extraction of hop compounds. This is the reason that hop utilization is higher.

The compact design means that only a small amount of room or floor space is required since the machine is mounted on a frame. A total of three pneumatic cylinders provide support and can be used to perform telescopic movements forwards or backwards.

The following optional features are available to increase the product safety of the hop material used to brew the resultant wort and beer: The simplest option involves delivery of a counter which displays the number of vacupacks which have been processed. This warrants that if their duties are interrupted, the brewhouse staff will not process too many or too few bricks, ensuring a correct hop addition. After the hop additions have been completed for a single batch, the counter can be reset to zero by pushing a button. A more complex option entails precisely



Fig. 3 The compressed hop separation machine (left) with a rectification wort boiling system (right) at Alpertsbacher Klosterbräu

weighing out the required amount of hops with load cells. This way, only the amount of hops actually needed is processed. The amount of hops required for an individual recipe can be set by linking the machine to the brewhouse control system.

A fully automated solution would start with loading hop bricks into a magazine. From there, the vacupacks would be transferred to the machine, the packaging opened, the hops separated and the packaging pressed and prepared for disposal. The prepared hops would be transferred to the

hop dosing equipment or directly sent to the wort kettle, based on the recipe stored in the brewhouse control system.

■ **Summary**

To simplify the handling of whole hops compressed and packaged in the form of hop bricks, Dillenburger & Hertel GmbH in cooperation with Banke Process Solutions and Martin Bierer Maschinenbau und Metallbau has developed a machine to cut the bricks into smaller pieces for hop additions in the brewhouse. Delivery and

commissioning the pilot system at Alpirsbacher Klosterbräu Glauner GmbH & Co. KG took place in December of 2014. Feedback regarding the design and operation of the machine has been very positive. The machine is easy to use and makes a significant contribution to work safety. Manual separation of hop bricks with simple tools, a process which consumes both time and energy, has been replaced with a machine which delivers reproducible and consistent results. This pilot project proved to be very successful. ■