

Four glasses of beer are lined up on a wooden tray. From left to right, the colors are light golden, amber, dark amber, and dark red. Each glass has a thick head of white foam. The glasses are condensation-covered and set against a light grey background.

# Fermentation. Redefined.

NEER™ trial protocol & guide

July 2020



## About Chr. Hansen

Chr. Hansen is a global bioscience company that has been improving food and health since 1874. This is important to us because over 1 billion people consume our products every day.

Using nature's own resources, we work closely with our customers to create ingredients for the food, health, and agricultural industries that have a positive impact on our world. Our natural solutions address some of today's most pressing challenges, including food waste, sustainable food production, and food safety.

Smartbev™ is our fast expanding range of dairy free bacteria and yeast specially selected for the use in fermented beverages.

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*Improving food & health*

# NEER™ a unique, patented yeast concept for the production of alcohol free beer\*



## **PICHIA KLUYVERI**

Isolated in New Zealand, selected for fermentation characteristics and its ability to only ferment monosaccharides.



## **FROZEN YEAST**

Typical CH approach: Direct pitching for convenience, speed and safety. From freezer to fermenter in 1 hour



## **CHARACTERISTICS**

Enhanced fruit flavours (esters/thiols) and medium production of polysaccharides for next generation full flavoured yet fresh alcohol free beer



## **PRODUCTION BENEFITS**

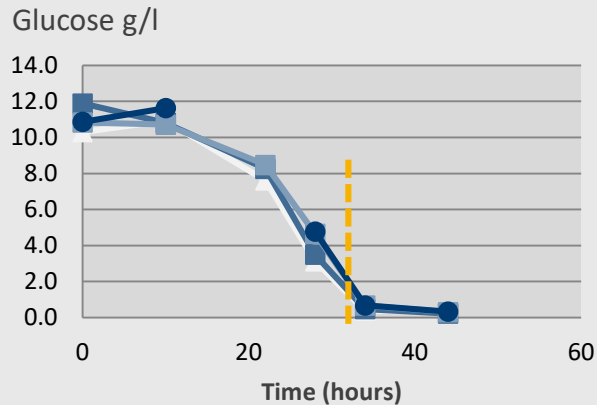
Without production of diacetyl the concept allows for shortened maturation cycles

\* And other fermented beverages

# NEER™ fermentation characteristics.

## SUGARS

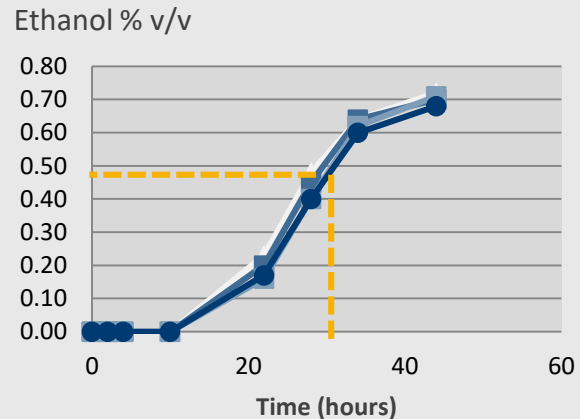
NEER™ only produces alcohol from monosaccharides and leaves the less sweet maltose untouched. It has been found that 10 g/l monosaccharides results in the formation of approximately 0.5 % alcohol.



It is possible to adjust the amount of residual sweetness and mouthfeel by lowering the amount of base malts and apply dextrin malts.

## ALCOHOL

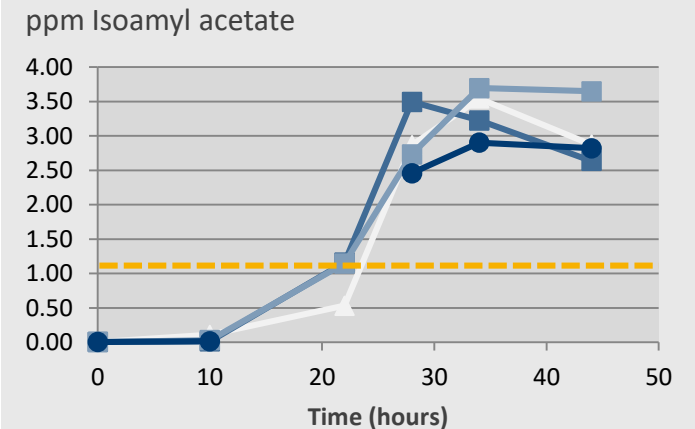
Alcohol concentration depends on initial monosaccharide and oxygen concentration. “High”-gravity brewing with subsequent dilution with deaerated water is possible.



NEER™ is Crabtree\* negative and the amount of produced ethanol can be controlled by managing the monosaccharide levels and dissolved oxygen concentration.

## ESTERS

The ester aromas produced by NEER™, e.g. isoamyl acetate, are substantial higher than the flavour threshold which allows for dilution without “losing” the effect of these essential aromas.



NEER™ produces a characteristic flavour profile most often associated with the descriptors peach or pear.

\* Crabtree negative do not produce alcohol in presence of oxygen



# Trial preparation

## Freezer

Take NEER from the  $< -45\text{ }^{\circ}\text{C}$  freezer or dry ice and open the box.  
Put the sterile Codan transfer set aside.



One hour prior to pitching put the NEER bag in a  $30\text{ }^{\circ}\text{C}$  water bath.

After one hour the NEER should be defrosted (check by visually inspecting the bag for remaining frozen product).

## Sample

In a sterile setting (LAF bench or next to a Bunsen burner) transfer the required volume of NEER to a sterile flask using the Codan transfer set.



Make sure the content of the bag is homogenous by carefully turning the bag up-down a couple of times.

Wipe water from the bag and spray the bag with 70 % ethanol. Peel of the foil covering the sterile septum of the bag.

## Transfer

Take the transfer set out of the bag, pinch the clamp, remove one end cap and insert the spike through the septum of the bag.



Remove the second end cap, loosen the pinch clamp and transfer the yeast by gently squeezing the bag. Re-pinch the clamp.

As sterile as possible, transfer the NEER yeast that has been measured out to the CCT (Conical Cylinder tank).

Ideally this can be done while the tank is being filled which creates a flow of air out of the tank that helps minimize the risk of contamination.



# NEER™ <0.5% v/v Alcohol part 1



**Dosage:** 1 bag (900 ml) for 500 hl (recommendation for large scale tanks with Iso-Mix or similar mixing systems). Recommendation for trial: 18-20 ml for 500 L mixed by pumping the CCT over. Pumping over is not as efficient as Iso-Mix hence the increased dosage rate.

**Recipe:** 4.5 – 9.0 °P depending on the amount of body needed in the final beer. At the lowest °P up to 5 g/l of dextrose can be added to provide enough fermentable monosaccharides for the yeast. Recipe suggestion to be provided by brewery – review during conference call. Please take a sample of the final wort for sugar analysis. The sample should be frozen immediately.



**Additions:** Tannic Acid (BrewTan B) at mash-in (10 g/'hl water' added to the water prior to the malt) and 15 min before end of boiling (4 g/hl as a 10 % solution in warm water and do not use any other fining agents). Yeast nutrients can be added.

**Temperature:** 16-18 °C is our recommendation, but the yeast is able to ferment outside this range. For the trial we recommend using a temperature within this range.

**pH:** At the end of boiling / whirlpool, adjust pH to 0.1-0.3 above target for final beer with lactic acid, as NEER will not lower the pH significantly during fermentation. Adjustment can also be done after fermentation. Lower pH can help balance residual sweetness.



**Mixing:** Continuous mixing throughout the fermentation is required. In-line mixing system like Iso-Mix for >120 hl, for smaller batch sizes a normal brewery pump will suffice. **This is a key to succeeding.**

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# NEER™ <0.5% v/v Alcohol part 2



**Aeration:** As normal, but important as the yeast will produce more ethanol if there is no oxygen present at the start of fermentation. We recommend using the maximum possible aeration which will depend if you are using oxygen or air.

**Time:** Until all monosaccharides has been consumed or 0.4% ethanol is reached. Expect 3-6 days. The fermentation can also be stopped earlier by cooling the tank but this will result in residual monosaccharides (additional sweetness).

**Cooling:** Cool to 1-2 °C as fast as possible when the fermentation is finished. Important not to go below 0 °C as the beer will freeze due to the absence of alcohol. Product should be stable for several months when stored at these temperatures.



**Centrifugation:** NEER does not flocculate, and therefore settles slowly. So centrifugation is recommended prior to pasteurization.

**Pasteurization:** 40-80 PU highly recommended (40 PU is enough to kill NEER), as a non-alcoholic product produced with NEER contains disaccharides (and higher saccharides) that makes the product prone/sensitive to contamination. Other types of pre-filling pasteurization is not recommended as the beer can get contaminated during filling.



**Hops:** Hop-bitterness can help balance residual sweetness. Bitterness can be adjusted post fermentation with iso-alpha extract. For hop aroma and flavor it is recommended to add the hops to the whirlpool as dry-hopping can lead to contamination.

Protect your brand

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# Fermented beverages with Chr. Hansen

Our microbial concepts allow full control over the fermentation process from a medium to a very large scale.

Working with selected and identified organisms is safer, traceable and consistent.