



**REMOVING COLOR FROM BEER USING
NANOFILTRATION TECHNOLOGY**

Case study

Production of a neutral base by removing color, aroma and taste using Nanofiltration membranes from beer as a precursor to the flavored beer

The

PROBLEM

Beer is one of the oldest, most extensively consumed beverages, which is typically made using malted barley, wheat, maize, rice, and oats. The beer color varies from a mild golden hue to a deep amber or dark brown. Flavored beer can be made by combining chocolate, coffee, and caramel to beer. Removing color from beer is a necessity for flavoring or blending. But removing the color, aroma, and taste from fully fermented beer is a complex process mainly achieved through thermal distillation and rectification.

The process involves heat energy, which is difficult to control and impacts the flavor profile

of the alcohol itself due to the possibility of denaturation during the distillation process.

Using Membrane separation and carbon filtration removes color, suspended solids, aroma, and taste and keeps the flavor profile intact without impacting the alcohol content in the final product.

In this case study, we will focus on the three tests which were performed using Hydranautics' Nanofiltration solution and Microfilt's carbon CMDF on different beer samples to produce a clear neutral base.

The

SOLUTION

An in-house lab-scale filtration system using Microfiltration, Nanofiltration, and Carbon CMDF was designed and assembled by Microfilt.



Figure 1: Picture of the lab-scale MF test unit



Figure 2: Picture of the lab-scale NF test unit

The samples of beer that were used for testing were:



Super Strong Beer - S1 A



Strong Beer (Gold) - S2A



Summer Lager Beer - S3A

The various membranes and filtration solutions were used:

- MF: Ceramic 0.2 micron for sample standardization
- NF: HydraCoRe50 for colour removal
- NF: HydraCoRe10 for colour removal
- NF: HydraCoRe70pHT for colour removal
- CMDF: Carbon for aroma and taste removal

Below are the tests that were performed:

Test 1: Hydranautics HYDRACoRe70pHT was used on the Super Strong Beer Sample

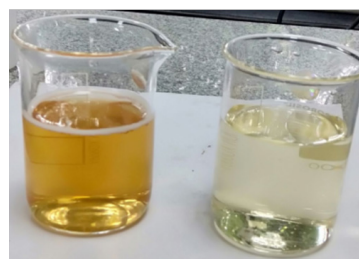
Super Strong Beer was clear and transparent after passing through the HydraCoRe70pHT membrane at a recovery of 46.0%. The trial was operated at 9.5 bar TMP at room temperature, and pump circulation flow was 200 LPH.



Feed Permeate Rejected

Test 2: Hydranautics HYDRACoRe10 was used on the Super Strong Beer Sample

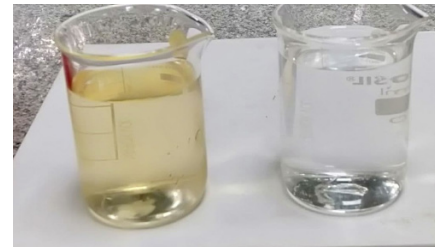
Super Strong Beer was clear and transparent after passing through the HydraCoRe10 membrane at a recovery of 72.63%. The trial was operated at 9.5 - 9.75 bar TMP at room temperature. The pump circulation flow was 230 LPH.



Feed HYDRACoRe10

Test 3: Hydranautics HYDRACoRe10 and Microfilt Carbon CMDF were used on the Super Strong Beer Sample

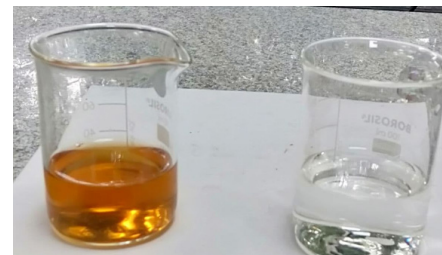
Permeate of HydraCoRe10 was used as a feed sample for trial. A feed sample near about 1.4 L had taken for the trial. A of total permeate 1.2 L was removed from the filter media. Super Strong Beer was clear and transparent after passing through CMDF Carbon 72 C membrane.



HYDRACoRe10 Carbon 72

Test 4: Hydranautics HYDRACoRe50 was used on the Strong Beer Sample

The filtrate of ceramic 0.2 microns was used as a feed. Strong beer was clear and transparent after passing through the HydraCoRe50 membrane at a recovery of 43.0%. The trial was operated at 15 bar TMP at room temperature, and pump circulation flow was 230 LPH.



Ceramic.0.2 HYDRACoRe50

With Hydranautics Nanofiltration membrane solution and Microfilt's filtration solution, a complex and high thermal energy driven process of manufacturing a neutral base can be simplified as per the customer's requirement. The essential criteria to note here is no impact on the amount of alcohol in the feed and permeate, which was apparent in all the tests performed. Therefore, membrane technology and filtration solutions are sustainable solutions for removing color, aroma, and taste from fully fermented beer without negatively impacting the flavor profile.

HYDRACoRe10 membrane did not remove all the color. Using it would reduce the life of the carbon increasing the operating cost. HYDRACoRe70pHT membrane removed all the color, but it required high feed pressure because the flux was low

Using it would increase the life of the carbon but will also increase the operating cost through high power consumption. HYDRACoRe50 membrane was the most optimum, removing most of the color and working at a moderate pressure.

All the color was removed with HYDRACoRe50 and HYDRACoRe70pHT. The permeate was slightly tinted with HYDRACoRe10. This tint was eliminated once it ran through the charcoal filter that worked as a polishing filter. The NF membrane essentially increased the usable life of the carbon filter severalfold, thus improving the economy of the treatment process. HYDRACoRe50 membrane was used for the main plant with higher capacity.

In Microfilt's tests, the aromas and tastes of the treated samples were likewise eliminated. This was accepted and approved by the end customer as well.

For more information about Hydranautics case studies, contact us at hy-marketing@nitto.com or visit our website at membranes.com

About Hydranautics

Since our founding in 1963, Hydranautics has been committed to the highest standards of technology research, product excellence and customer fulfillment. Hydranautics entered the Reverse Osmosis (RO) water treatment field in 1970 and is now one of the global leaders in Integrated Membrane Solutions. Hydranautics became a part of the Nitto Group in 1987. Nitto is Japan's leading diversified materials manufacturer. The group offers over 13,000 high value specialty products worldwide including optical films for liquid crystal displays, automotive materials, reverse osmosis membranes for desalination and transversal drug delivery patches.

As leaders of high quality membrane solutions, we believe our commitments extend beyond manufacturing and selling our products. Our skilled staff of technicians, engineers and service professionals assist in designing, operating and maintaining a robust, reliable and efficient membrane system to meet your requirements and exceed your expectations.

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