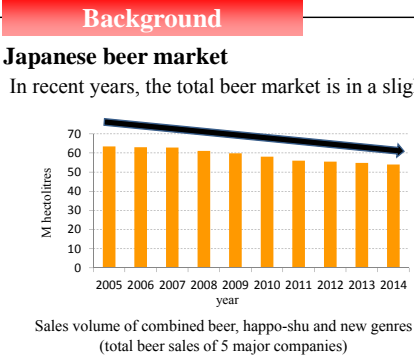


Development of flavor customizing beer servers

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<Abstract>
We developed a "Beer Infuser" server, which can enhance the value of served beer through customizing beer flavor and taste. The unique advantage of this serving system lies in a variety of flavor and taste can be added such as hop, cinnamon, and lemon peel, while CO2 content can be maintained in beer. It's concepts and monumental appearance have attracted many media since its market launch for KIRIN's craft beer restaurants, leading to the "Good Design Award 2015".



KIRIN's mid-term challenge

- To Enhance KIRIN's brand value among the younger generation
- To make "beer" more attractive through creating a new beer culture/movement

Opening of brewery restaurants "Spring Valley Brewery" (SVB) in 2015

- Not just a typical beer restaurant or beer pub
- Beer-experience facilities like an entertainment park for beer fans!
- Original craft beer style unique to Japan and KIRIN

Mini breweries with "Beer Infuser"



Our specially designed cylinder can customize beer flavor and taste, keeping original CO2 content, through contacting beer with natural materials just prior to serve, such as hop, herbs and fruits. Much fun of customers is to see this percolation through the transparent cylinders.

Beer × **Natural materials** = ?

ex) Pilsner beer, contacted with hop, is changed to IPA?



Technical challenges & Solutions

Challenge 1 : Maintenance of CO2 content and avoidance of foaming in beer introduction to a percolation cylinder.

Solution : Use of counter pressure and control of pressure balance

1. Pressurize the cylinder : P1 + 0.02 MPa
2. Gradually reduce pressure in cylinder
3. Introduce beer to cylinder when P1 = P2
4. Keep P1 - P2 ≤ 0.015 MPa through beer introduction

Image of pressure control

Example of pressure balance depending on flavor and taste materials

Differential pressure P1 - P2 (MPa)	Height of form in cylinder			
	Only beer	Adding hop	Adding cinnamon	Adding peel
0.005	○	○	○	○
0.010	○	○	△	△
0.015	△	△	△	△
0.020	×	×	×	×

Foam height in the cylinder ○: 0~10 mm, △: 10~30 mm, ×: too much

Schematic image of Beer Infuser

Challenge 1 (Counter), **Challenge 2** (Regular beer server route), **Challenge 3** (Chiller), **Challenge 4** (Infuser bypass route), **Challenge 5** (Hop)

Challenge 4 : Maintenance of a constant flavor extraction.

Solution : Use of a single batch process.

Use a dual-cylinder system; this system is designed so that flavor materials are kept only inside the inner cylinder, leading to an easy removal of the materials after percolation

Image of batch process

Image of extraction

	Level of extract
1st.	+++++++
2nd.	++
3rd.	+

Inner cylinder

Challenge 2 : Proper serving to a beer glass.

Solution : Optimization in beer flow between pressure in the cylinder and tube length/diameter.

1. Increase counter pressure more than 0.12 MPa to prevent forming inside the beer tube
2. Set an appropriate resistance to beer flow with a tube of 4 mm in diameter and 2 m in length to prevent the excessive forming of beer served into a glass

Example of appropriate counter pressure depending on tube specifications

Cylinder- to-tap length of beer tube	Pressure in beer tube in serving beer (MPa)				
	0.12	0.14	0.16	0.18	0.20
Φ4 mm × 4 m	20.0 s	18.5 s	17.0 s	15.5 s	15.0 s
Φ4 mm × 2 m	17.5 s	14.5 s	13.5 s	none	12.0 s

Challenge 5 : Creation of customers' FUN !

Solution : Watchable on-going percolation

Use transparent parts only to the customers' side of the cylinder (Meshed metal parts for contacting flavor materials and passing beer are used to the opposite (operators') side only)

Challenge 3 : Serving of cool beer.

Solution : Use of a cooling unit

Set the cooling unit after the cylinder for controlling the temperature of serving beer to 0 - 7 °C