

Hitachi Zosen
INOVA

Boston KY / USA

Turning Distilling Waste into Valuable Resources



Powered by Biomethane/RNG, Reducing GHG Emissions, Increasing Revenue

The Booker Noe Distillery is the largest of its kind in the US state of Kentucky. To boost its efficiency, profitability and environmental performance, it's now being expanded with the help of Hitachi Zosen Inova's integrated resource recovery solutions.

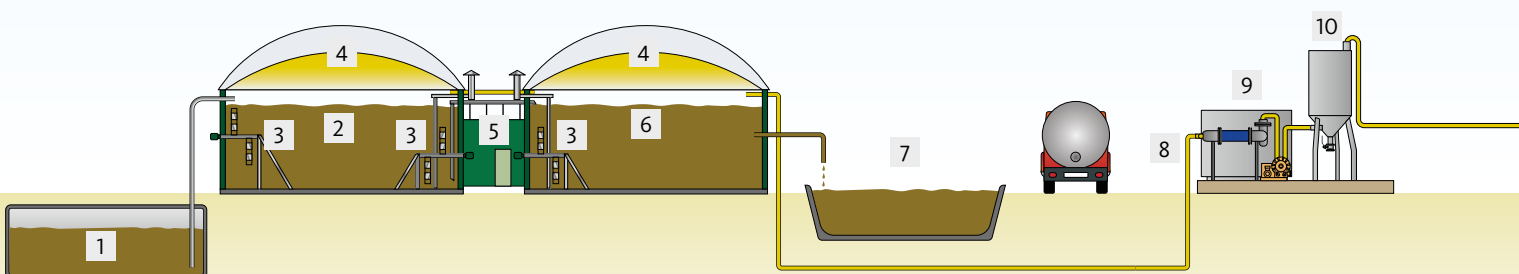
The objective is to capitalise on the economic and environmental potential of the stillage produced in the distillation process. With the right integrated systems, this organic waste is converted into a number of valuable resources. These include biogas, produced by digesting the stillage and then cleaned and upgraded to biomethane for use to run the distillery. The digestion process also yields a carbon-negative, fossil-fuel-free by-product that can be used to produce fertiliser – an additional revenue stream.

This is all possible thanks to proprietary in-house renewable gas solutions supplied by Hitachi Zosen Inova (HZI), a global greentech company based in Zurich, Switzerland, operating via its subsidiary HZI North America. The comprehensive range spans everything from the preparation and pretreatment of biogenic waste, anaerobic digestion, gas

cleaning and compression to CO₂ capture and utilisation. It also features green hydrogen generation technology. HZI has the expertise and resources to provide these solutions on a turnkey and financed basis. This allows beverage industry clients to boost their environmental performance and generate additional revenues while focusing on their core business of producing and delivering beer, wine and spirits.

Flagship US Project: Turning Distillery Stillage into Carbon-Negative Biomethane

HZI North America's latest major renewable natural gas (RNG), North America's term for biomethane, project is the 3 Rivers Energy Partners Boston Kentucky Facility. From 2025, up to 1 million short tons (907,000 metric tons) of distillery stillage will be treated every year in a total of



Waste Receiving & Pretreatment

1 Substrate

Anaerobic Digestion

- 2 Primary digester
- 3 Agitator
- 4 Gas holders
- 5 Pump room
- 6 Secondary digester

Discharge

7 Digestate storage

Gas Pretreatment

- 8 Raw gas pipeline
- 9 Drying and precompression of raw gas
- 10 Desulphurisation

eight 9,000 m³ digesters. In a downstream pressureless amine scrubber upgrading facility, also supplied by HZI, 6,900 Nm³/h (4,300 SCFM) of biogas will be cleaned, compressed and then fed back into the production cycle as the energy carrier biomethane/RNG. This will be used by the distiller supplying the stillage to help reduce GHG emissions by up to 50%.

The digestion process will also produce a carbon-negative, fossil-fuel-free by-product that the client, 3 Rivers Energy, will use for fertiliser production. This circular economy approach will result in significantly lower operating costs while also reducing the distillery's overall carbon footprint, cutting onsite greenhouse gas emissions by half.

Organic Waste from Beverage Production: an Untapped Resource

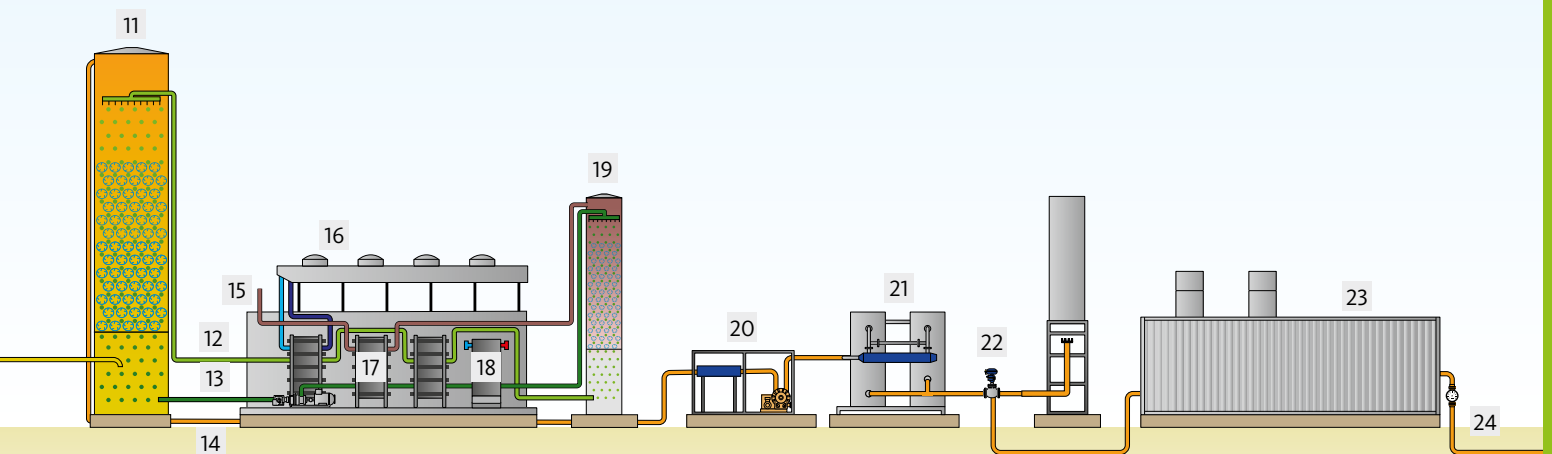
The beverage production sector, including the wine, beer and distilling industries, produces millions of tons of waste from crops every year. Historically, this waste has been given away for free or removed for a cost. HZI North America is working with beverage producers to provide integrated resource recovery solutions that convert this waste into biomethane that can be used as fuel to operate the plant, injected into the natural gas grid or utilised for transportation. HZI's solutions can also include the capture and liquefaction of carbon dioxide for use in the plant for cold storage or sequestra-

tion – an increasingly important advantage for key players in the food and beverage industry.

Business Drivers: Certificates and Incentive Programs

Integrated resource recovery is becoming increasingly attractive and worthwhile for players in the US beverage sector. In November 2023, the U.S. Environmental Protection Agency (EPA) awarded eight distilleries the ENERGY STAR certification, the label for energy efficiency supported by the US government. The EPA has compiled a catalogue of almost 180 measures in categories such as “motor systems”, “distilling” and “by-product processing”, enabling distilleries to save energy or use it more efficiently. They include installing integrated dry and wet anaerobic digestion (AD) systems for processing organic production waste. At the same time, newly introduced state and federal programmes are providing incentives for the construction of renewable energy installations.

The government, the media and environmental associations are thus giving the topic of sustainability major publicity – publicity that can be understood by the public at large. Given the economic and reputational benefits, there are obvious incentives for companies in the beverage industry to consider ways of harnessing fossil-free energy to contribute to a more stable and reliable energy supply.



Gas Upgrading

- | | | |
|---|--|--|
| 11 Amine scrubbing column | 14 Biomethane pipeline | 18 Heat input |
| 12 Regenerated amine scrubbing solution | 15 CO ₂ for utilisation in various applications | 19 Desorber column (CO ₂ removal with heat) |
| 13 Scrubbing solution amine rich | 16 Table-top cooler | 20 Drying and compression of biomethane |
| | 17 Heat exchanger | |

Energy Recovery

- | | |
|---------------------------|--------------------|
| 21 Fine drying | 23 Injection unit |
| 22 Biomethane distributor | 24 Public gas grid |

General Project Data

Client	3 Rivers Energy Partners
Owner and operator	3 Rivers Energy Partners
Commissioning	2025
Scope of delivery	Design, construction, commissioning; includes integrated process piping and controls for: Wet AD: 8 x 9,000 m ³ tanks (5 primary digesters + 3 secondary digesters) BioMethan upgrading technology: XL Model, A Series (amine scrubbing)

Technical Data

Annual capacity	907,000 t/a (up to 1 million short tons/y)
No. of digesters	8
Digester type	9,000 m ³ steel digester
Biogas use	Upgraded into biomethane
Type of waste	Spent stillage (whiskey mash) from the distilling process
Biomethane use	Renewable natural gas for distillery operations
Type of upgrader	A Series, XL Model, 6,900 Nm ³ /h (4,300 SCFM)

Output

Biogas produced	up to 6,900 Nm ³ (4,300 SCFM)
Biomethane produced	up to 4,100 Nm ³ (2,500 SCFM)
Electricity generated	18.3 MW electrical generation capacity equivalent for boiler operations
Liquid output material	up to 2,100 t/d (2,300 short tons/d)
Heat generated	5.2 MW/h for amine process