American Craft Spirits Association
BRIDGING the FUTURE
ACSA's 5th Annual Distillers Convention and Vendor Trade Show
March 5-6, 2018 | Pittsburgh

Full of Spirit: Designing Multi-Spirit Distilleries

James Ludford-Brooks,

Briggs of Burton

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Quickly – Who are Briggs of Burton?

- US Engineering Company
  - Equipment Design and Manufacturing
  - Project Management
  - Process Design
  - Health and Safety
- Long history working in the brewing and distilling industries
- Head office in the home of brewing
  - Burton on Trent, UK

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Briggs – Distilling



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Distilled Spirits Market

- Markets shift ∴
  - Focus on modular and flexible systems
  - Capable of producing a range of spirits under one roof
  - Premiumisation:
    - Malts
    - “Grain-to-Glass”
    - “Single Estate”
- Cross-over from Craft Brewing
  - Diversification
  - Excess wort production for spirits

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Talk Outline

Processes to make these:

- Whiskies
  - American
    - Bourbon
    - Single Malt
  - Scotch
    - Single Malt
    - Grain
  - Irish
    - Pot Still
- Neutral Spirit
  - Gin
  - Vodka

Grain Processing:

- Grain Cooking
- Mashing / Lautering

Fermentation

Distillation

- Column
- Pot

“Brewstilleries?”

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Grain Processing

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Grain – Alcohol Yields

Starch	Alcohol Yields	
	L / Te	lbs per gal ETOH
Maize (Corn)	387	20
Barley		
Malted Barley	379	22
Wheat	334	25
Rye	321	26
Oats	278	30
Rice		
Potato		

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Mashing – Starch Gelatinization Temp.

Starch	Gelatinization Temp. Range	
	°C	°F
Maize (Corn)	62 – 77	143 – 171
Barley	60 – 62	140 – 144
Malted Barley	64 – 67	147 – 153
Wheat	52 – 66	126 – 151
Rye	49 – 61	120 – 142
Oats	52 – 64	126 – 147
Rice	61 – 82	142 – 180
Potato	56 – 71	133 – 160

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Source: Briggs et al., Brewing Science and Practice, page 38.

Example – Mash Bills

	Bourbon	Tennessee	Rye	Scotch Malt	Scotch Grain	Irish Pot	Neutral Spirit
Maize (Corn)	70	80					✓
Barley						60	✓
Malted Barley	15	10	15	100	20	40	
Wheat					80		✓
Rye	15	10	85				✓
Oats						*	
Rice							
Potato							✓

*Oats low yield but recognised as a filter aid

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Mashing – American Whiskies

Grain Milling

- Not typically milled
  - Corn (Maize)
  - Buckwheat
  - Rice
  - Oats
- Milled
  - Barley
  - Wheat
  - Rye
- Using Hammer Mill or closed gap 4 Roller mill

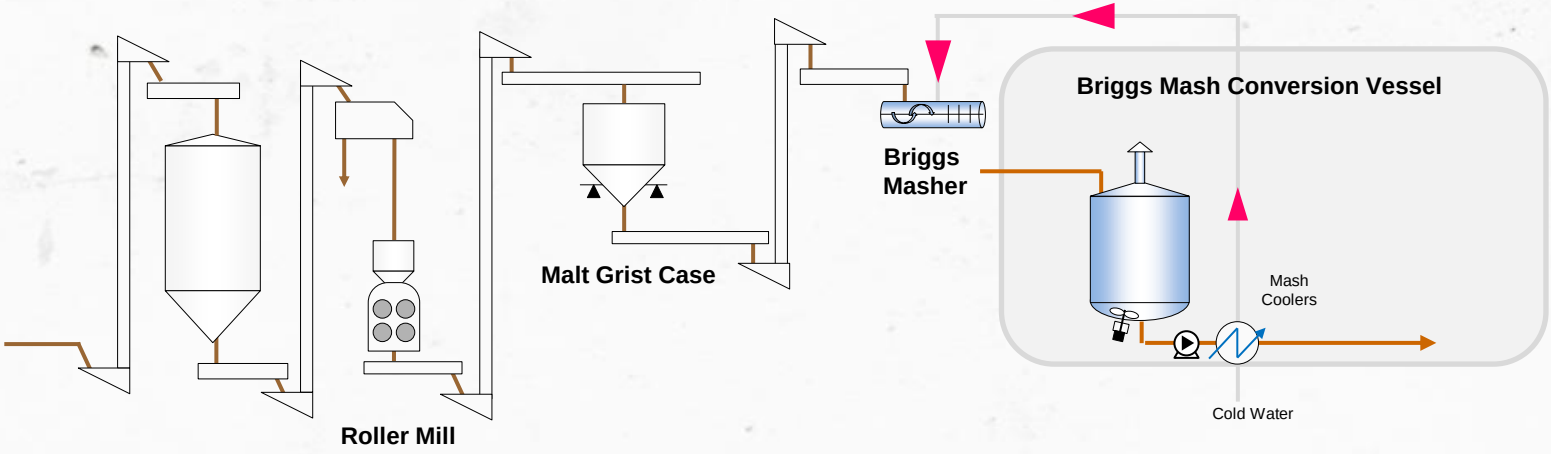
Mashing Process

Mash Conversion Vessel (MCV) or pot still

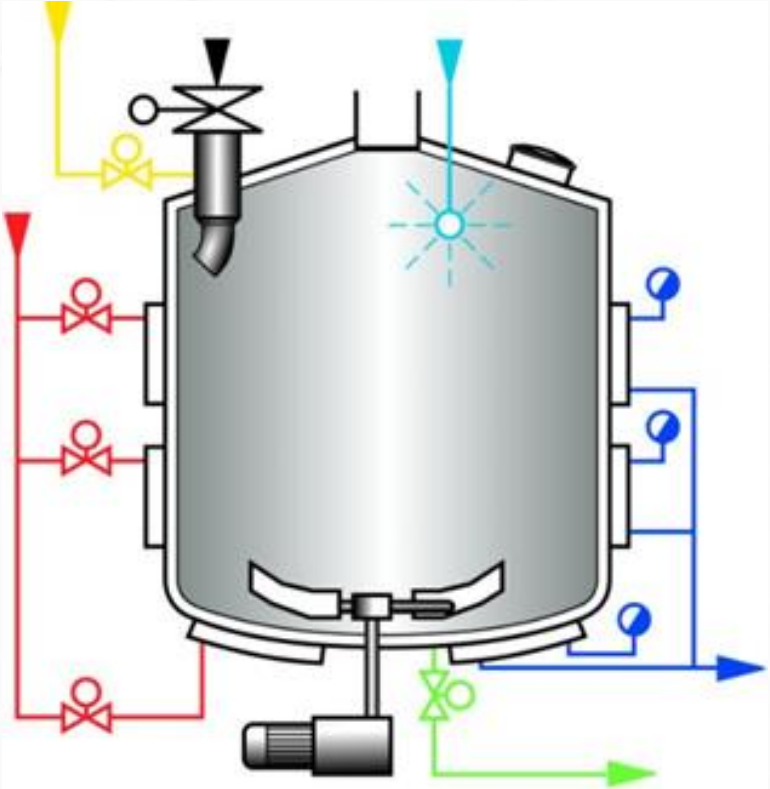
- "All Grains" = No husk separation
- Atmospheric vessel (MCV)
- Backset ' Sour mash'
  - 10% Mash Water vol.
- MCV Cooling
  - Mash Water – (Single Vessel Decoction)
  - Malt addition
- Dual purpose jackets
  - heating (steam medium)
  - cooling (cooling water inlet).
- Mash Cooler
  - Heat recovery
  - Tubular or Wide gap Plate HEX

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Grain Cooking



Mashing – Grain Cooking



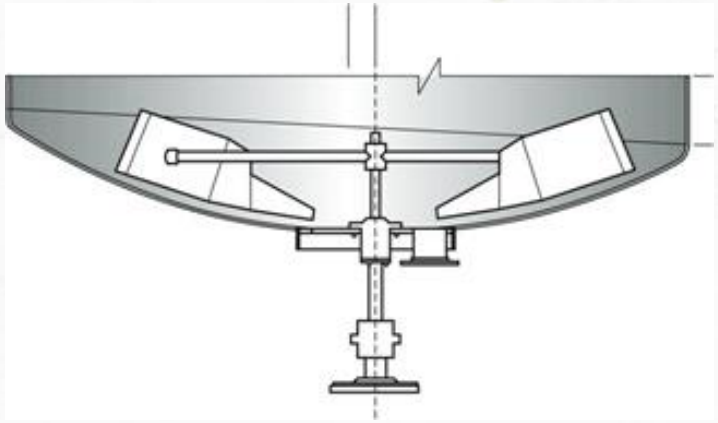


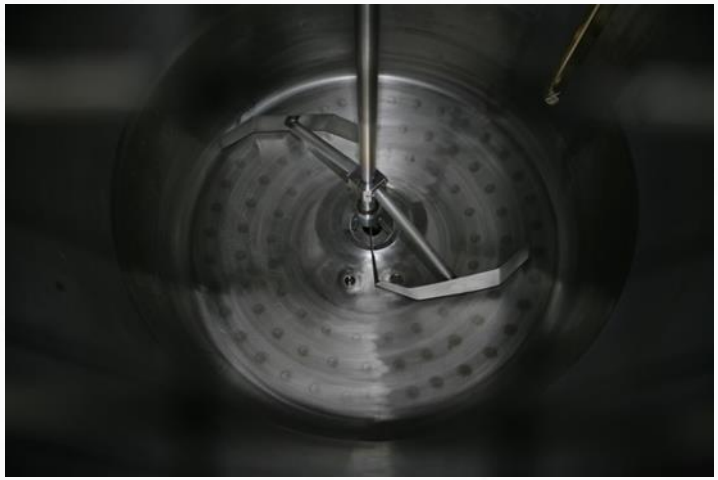
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Grain Cooking / Mash Conversion Systems

Heating and Cooling

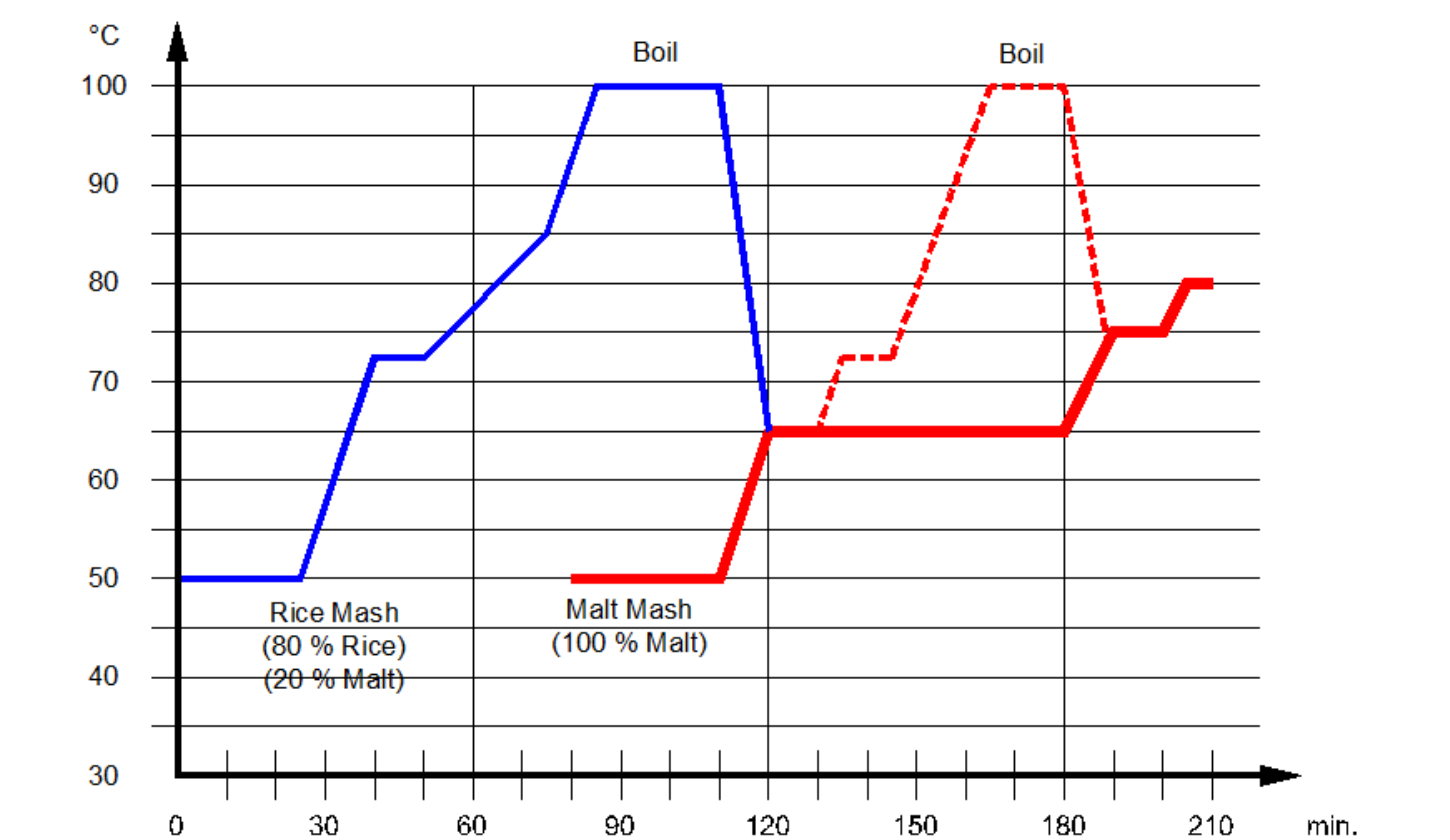
- Jacketed vessel
- Direct steam injection
  - Preference for clean steam generator
  - Avoid taint from boiler feed water
- Internal heating coil
  - Cleaning





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Grain Cooking - Decoction Mashing Process (Rice)



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Mashing – Scotch, Irish and Japanese Whiskies

Grain Milling

- Course grits requirement for malt
  - MCV / Lauter Tun
  - 4 roll mill
- Un-malted Barley
  - 4 roll mill with close gap setting
  - Or separate Hammer mill

Mashing Process

Options:

- 100% Malt Whiskey
  - Mashed directly to Lauter Tun
- Irish ‘Pot’ Still Whiskey
  - Malt and Barley
  - Mashed into Mash Vessel then transferred to Lauter Tun
- Clear Worts Obtained
- Wort Cooler
  - Heat recovery
  - Tubular or Wide gap Plate HEX

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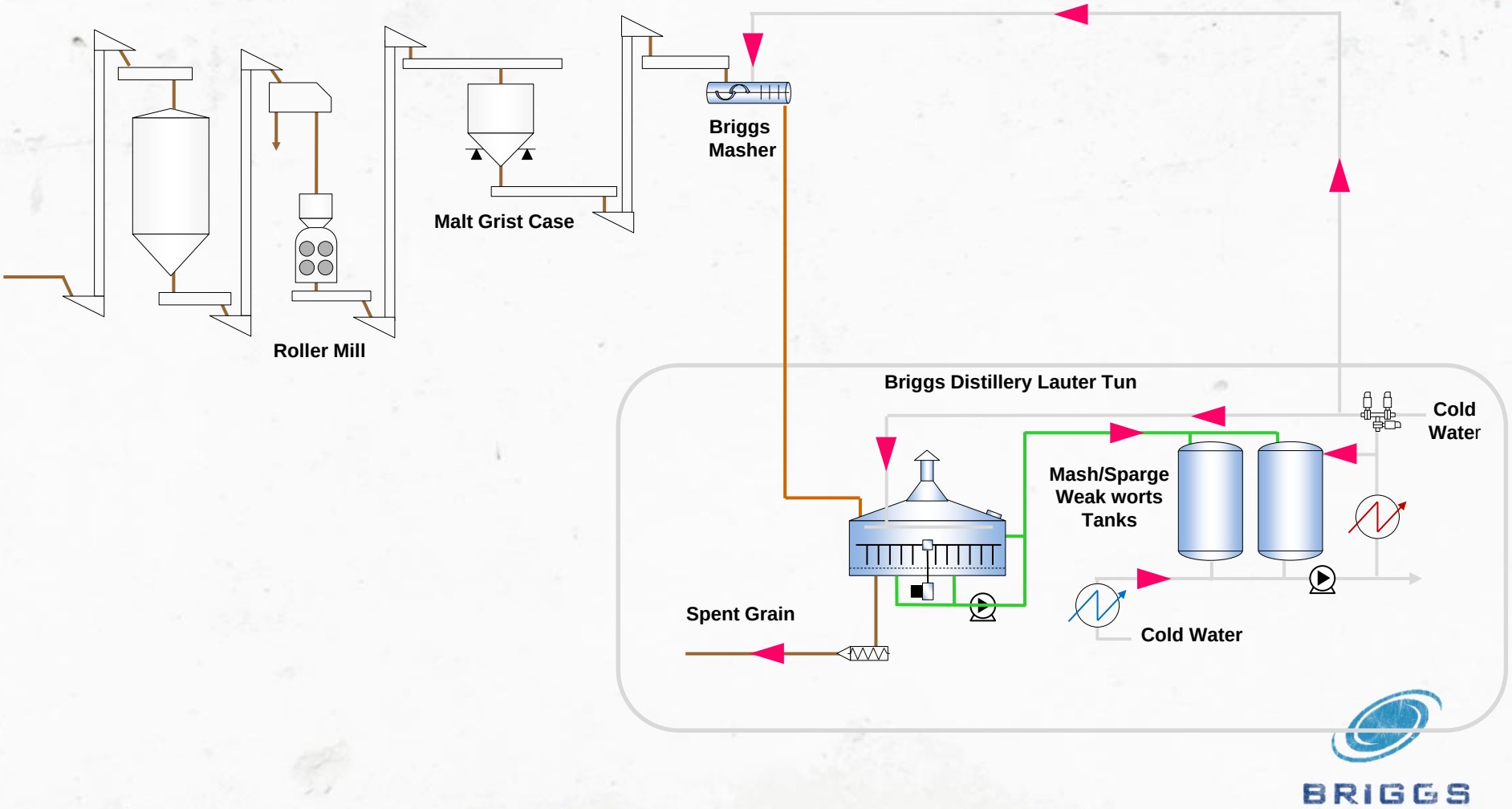
Distillery Lauter Tun

- Malted Barley
  - Malt Whiskies
    - American
    - Scotch
    - Irish
    - Japanese
- Husk forms filter bed
- Influence Wort Clarity
  - Clear (Beer)
  - Cloudy

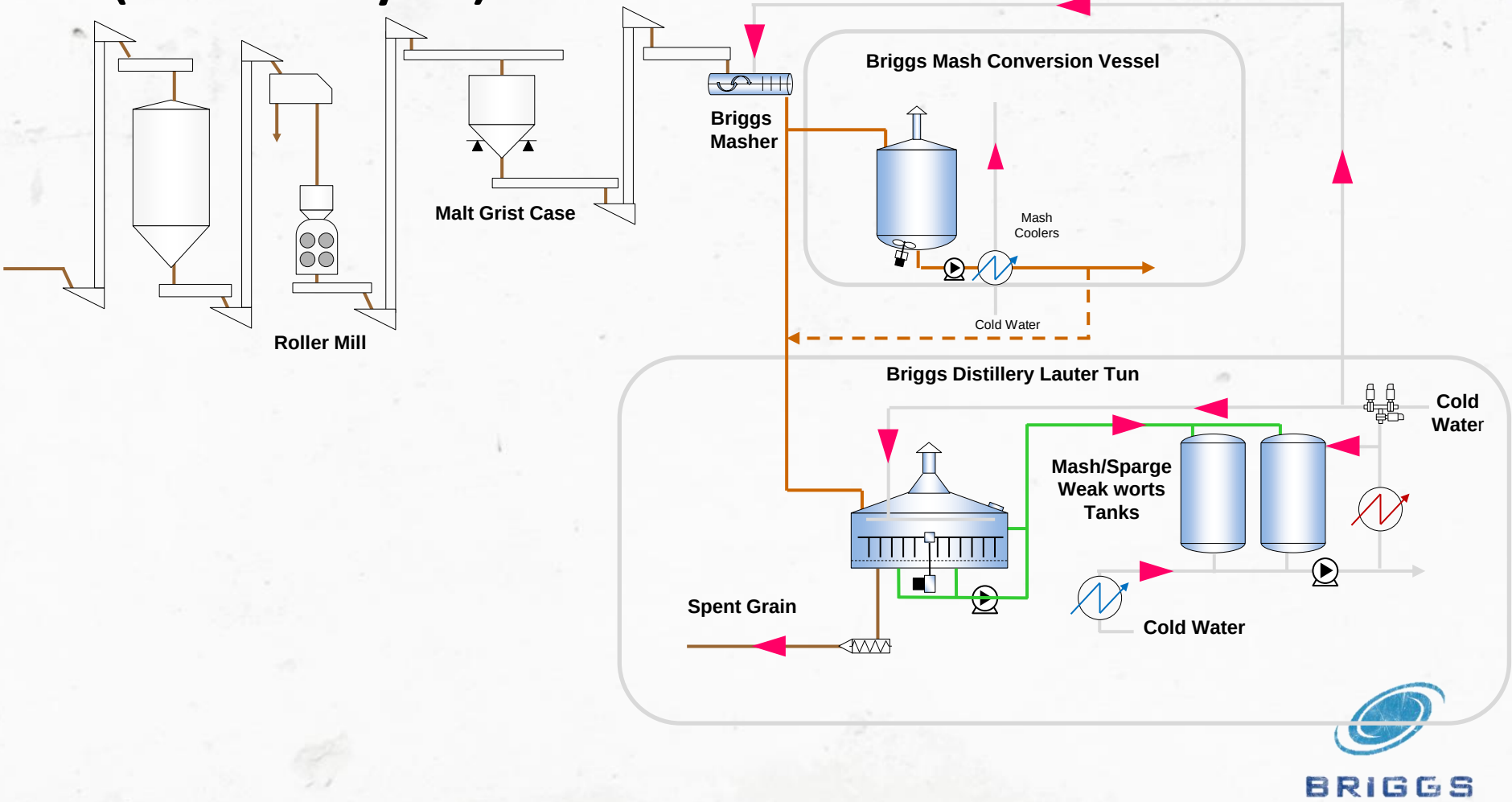


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Lautering

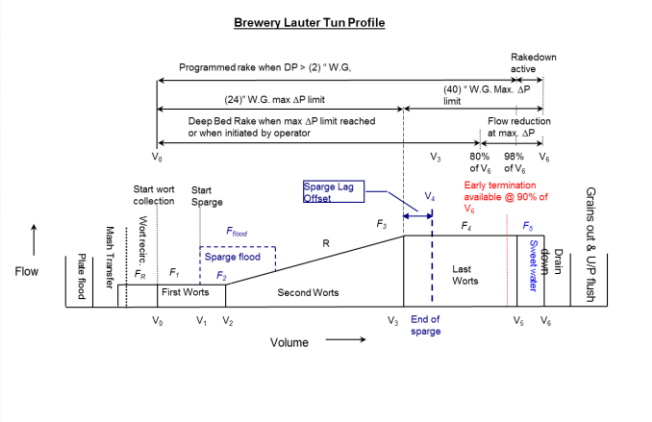

Roller Mill
Malt Grist Case
Briggs
Masher
Briggs Distillery Lauter Tun
Cold
Water
Mash/Sparge
Weak worts
Tanks
Spent Grain
Cold Water

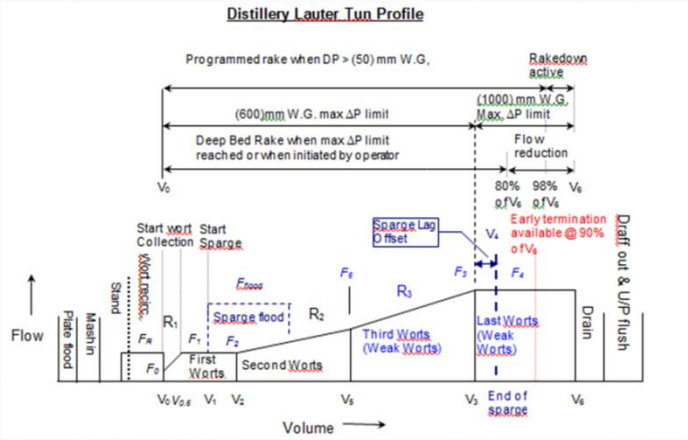
Grain Cooking + Lautering (Irish Style)



Distillery Lauter Tun - Operation

- Sparge weak worts to improve yield
- Question on payback at Craft Scale
- Without weak worts collection the mash in the Lauter Tun is thicker





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Distillery - Mash Filter

- Design for high volume, Mash separation in the brewing industry
- Consistently clear wort
- Two in Scotland
  - Diageo Teaninich Distillery
  - InchDairnie Distillery





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Fermentation

- Materials of construction
  - Wooden
  - Stainless Steel
- Variables (Control)
  - Time
  - Temperature
  - Yeast strain
  - % ABV
    - largely affected by extract yield
  - Foaming
  - Nitrogen Content (FAN)
    - Grains are FAN deficient
    - Compensated with Backset?
- Agitation
  - Grains In
- CO_2 = Asphyxiating





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Distillation

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Distillation

Wort / Wash

Steps:

- Fermentation
- Distillation

Source:

- Distillery
- From existing Brewery wort

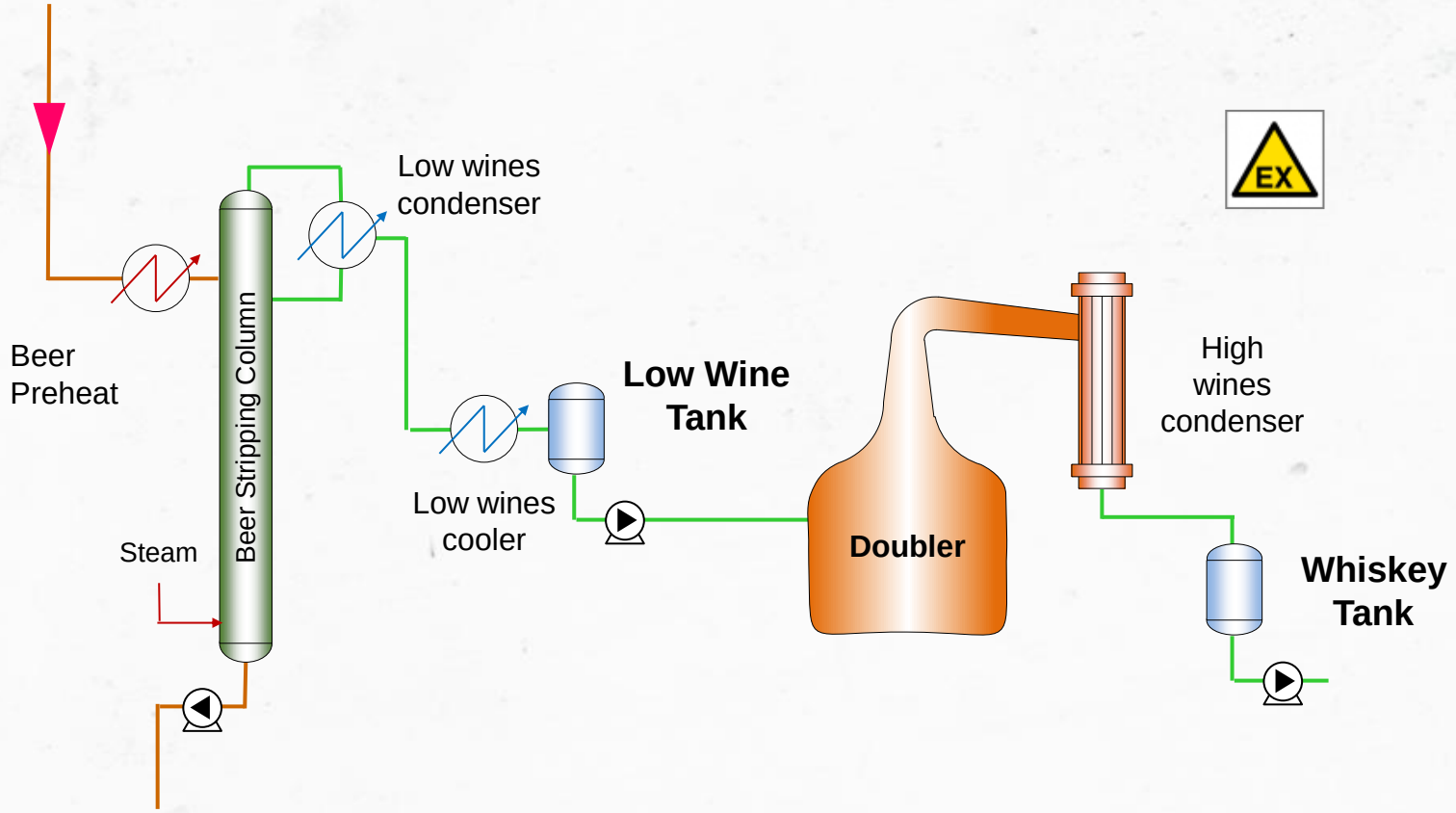
Neutral Spirit

Steps:

- Vodka
  - Rectification
  - Filtering
- Gin
  - Infusion with botanicals
  - Rectification

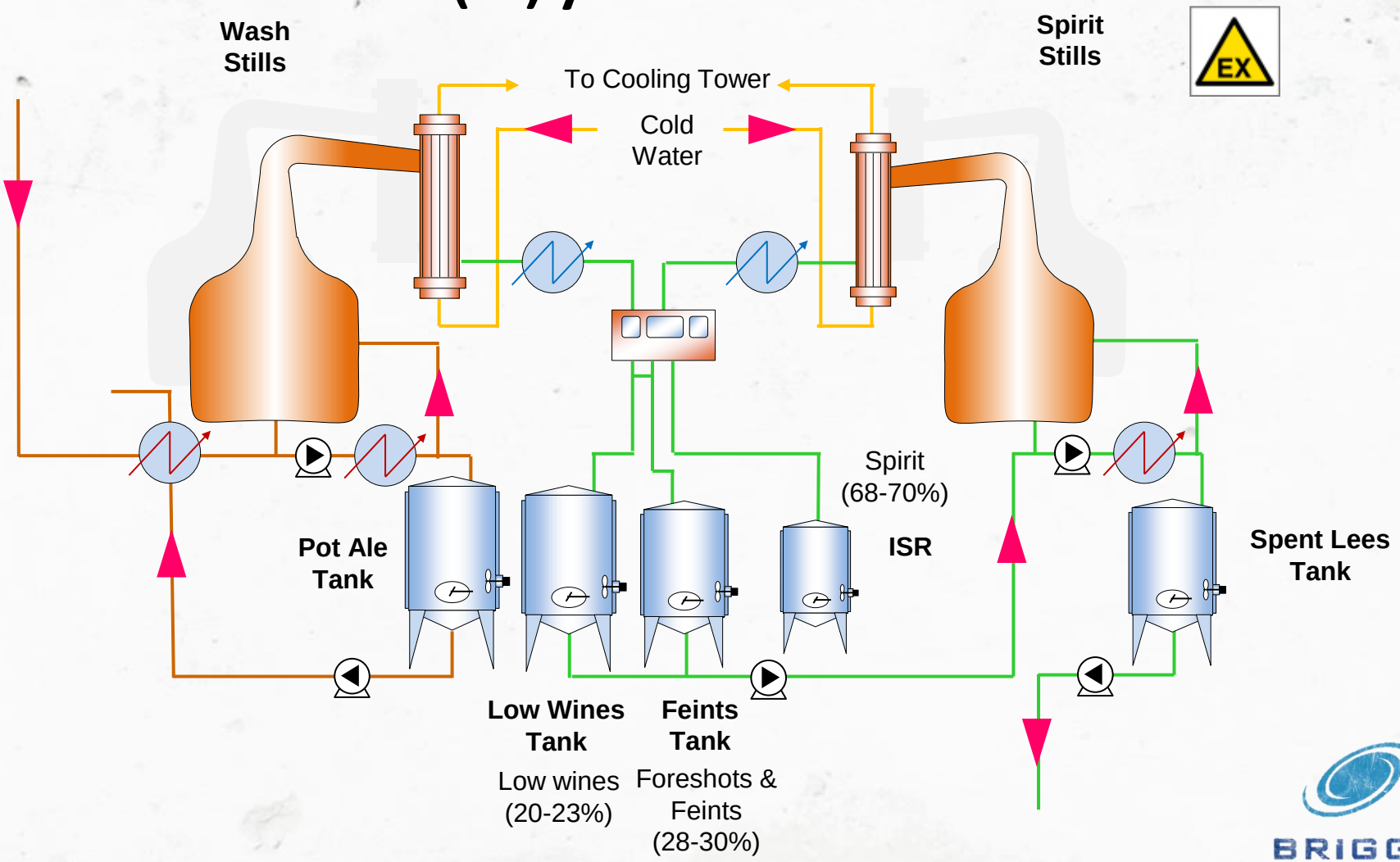
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Grain Whiskey Spirit (GWS)



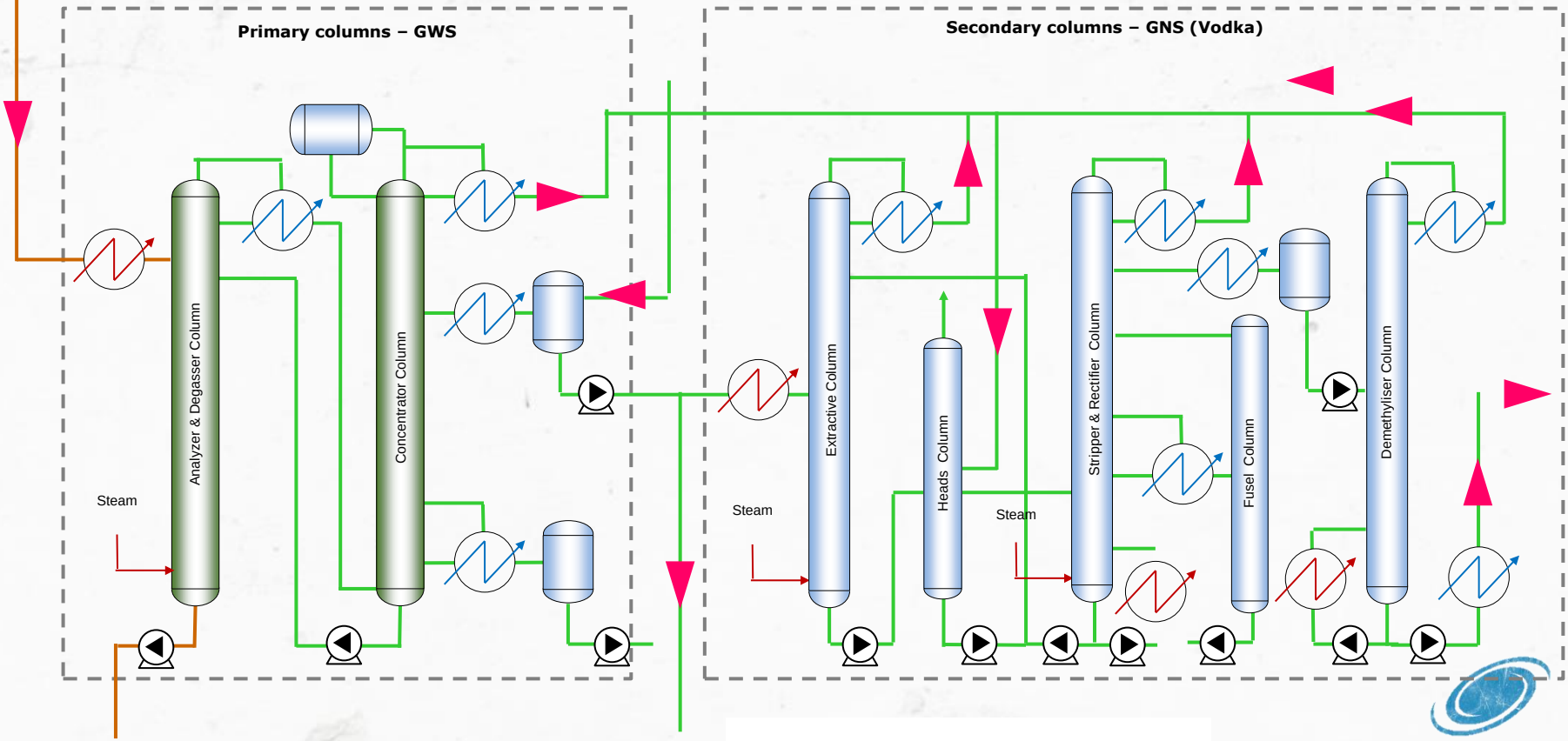
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Pot Whisk(e)y Production

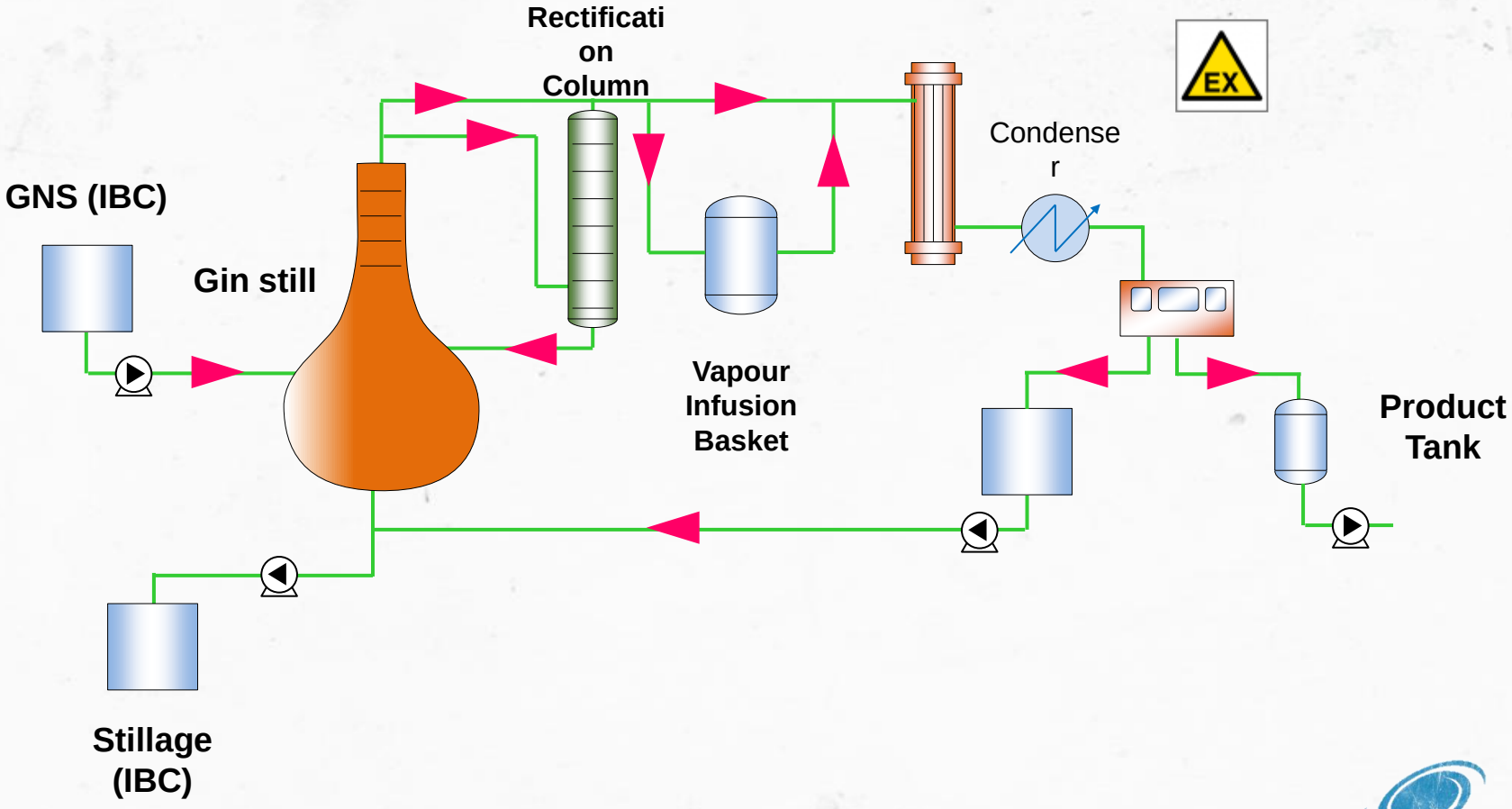


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Industrial Neutral Spirit Production



Infused Spirits (Gin)



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Brewstillery Concept

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Distilling and Brewing – Quick Comparison

Distilling

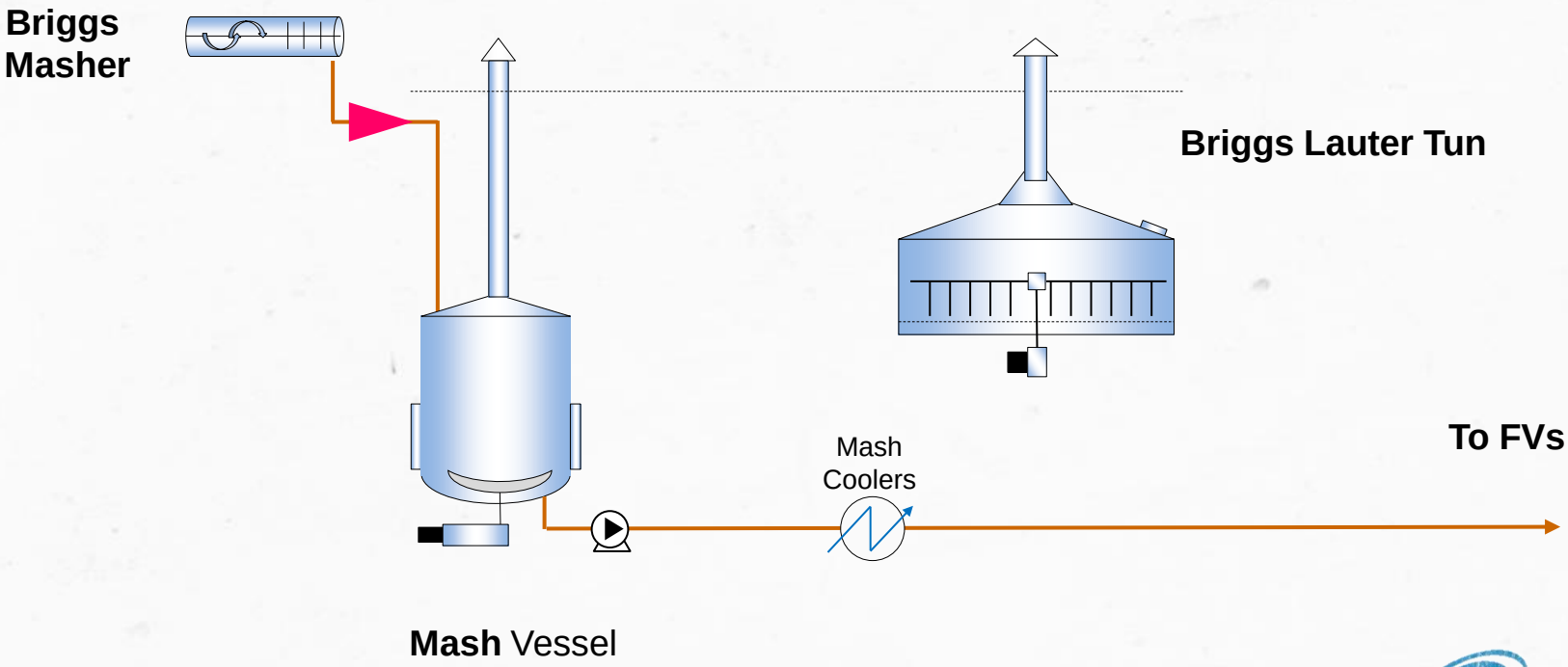
- Malt
- Grain Cooking
  - Grains In
- Clear or Cloudy wort
- Not Boiled
  - Secondary Fermentation
- Weak Worts collection (optional)
- Distillers Yeast
  - Higher Temperature and %ABV
  - Single-Use

Brewing

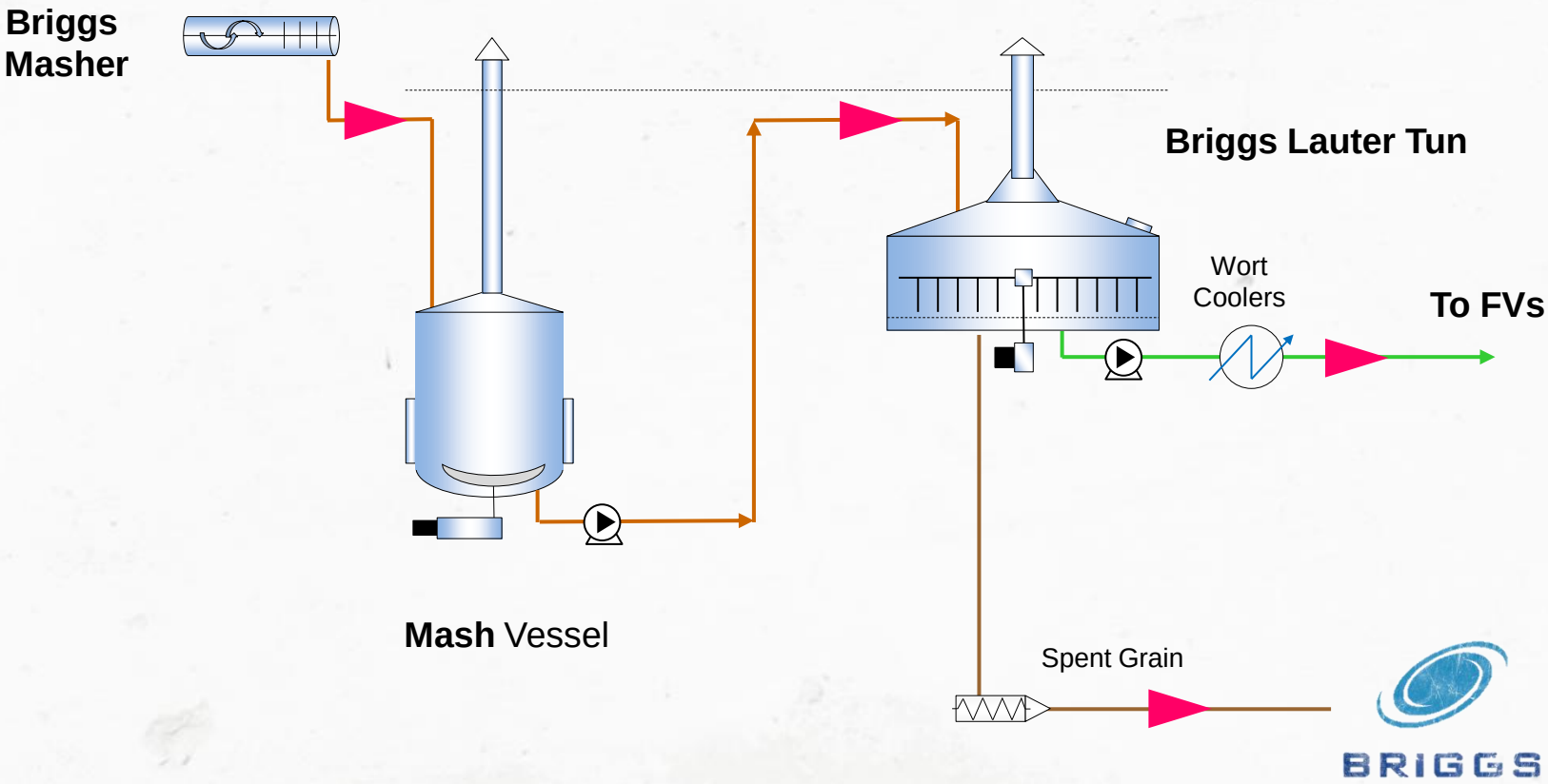
- Malt
- Grain / Adjunct Cooking
  - Mash Separation
  - Lauter Tun / Mash Filter
- Clear Wort
- Wort boiled in Kettle
  - Increased Gravity
  - Hops added
- Yeast
  - Ale / Lager
  - Temperature and flocculation
  - Crop and re-pitch

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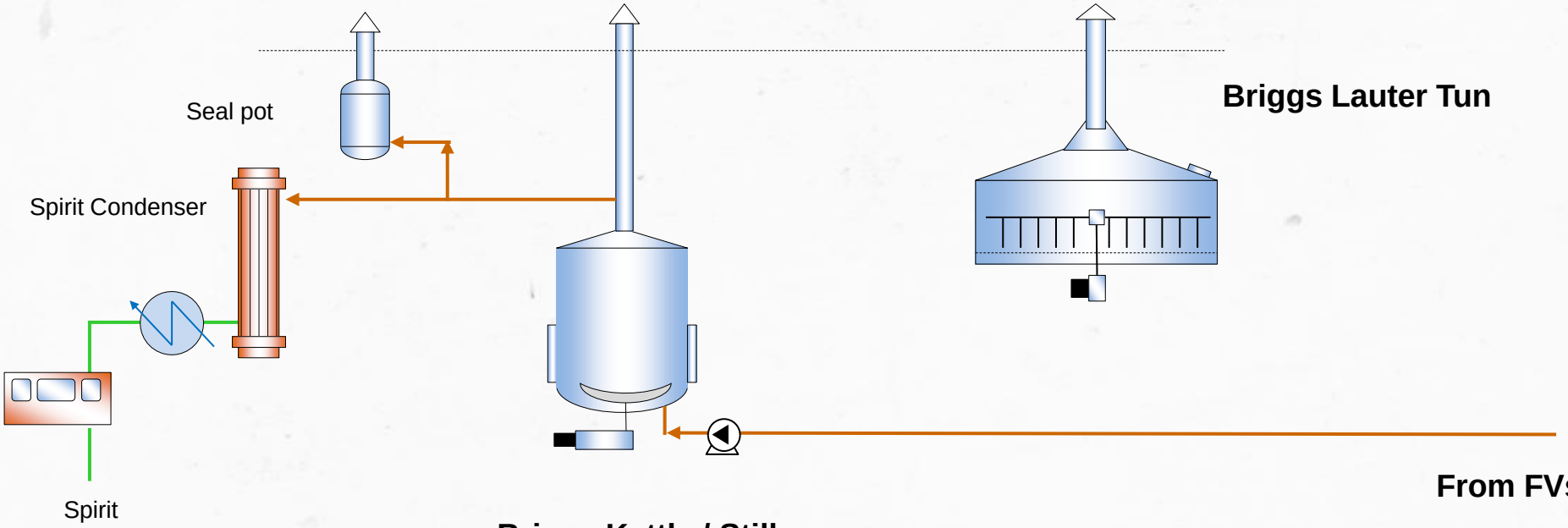
Brewstillery Concept – Grain Whiskies



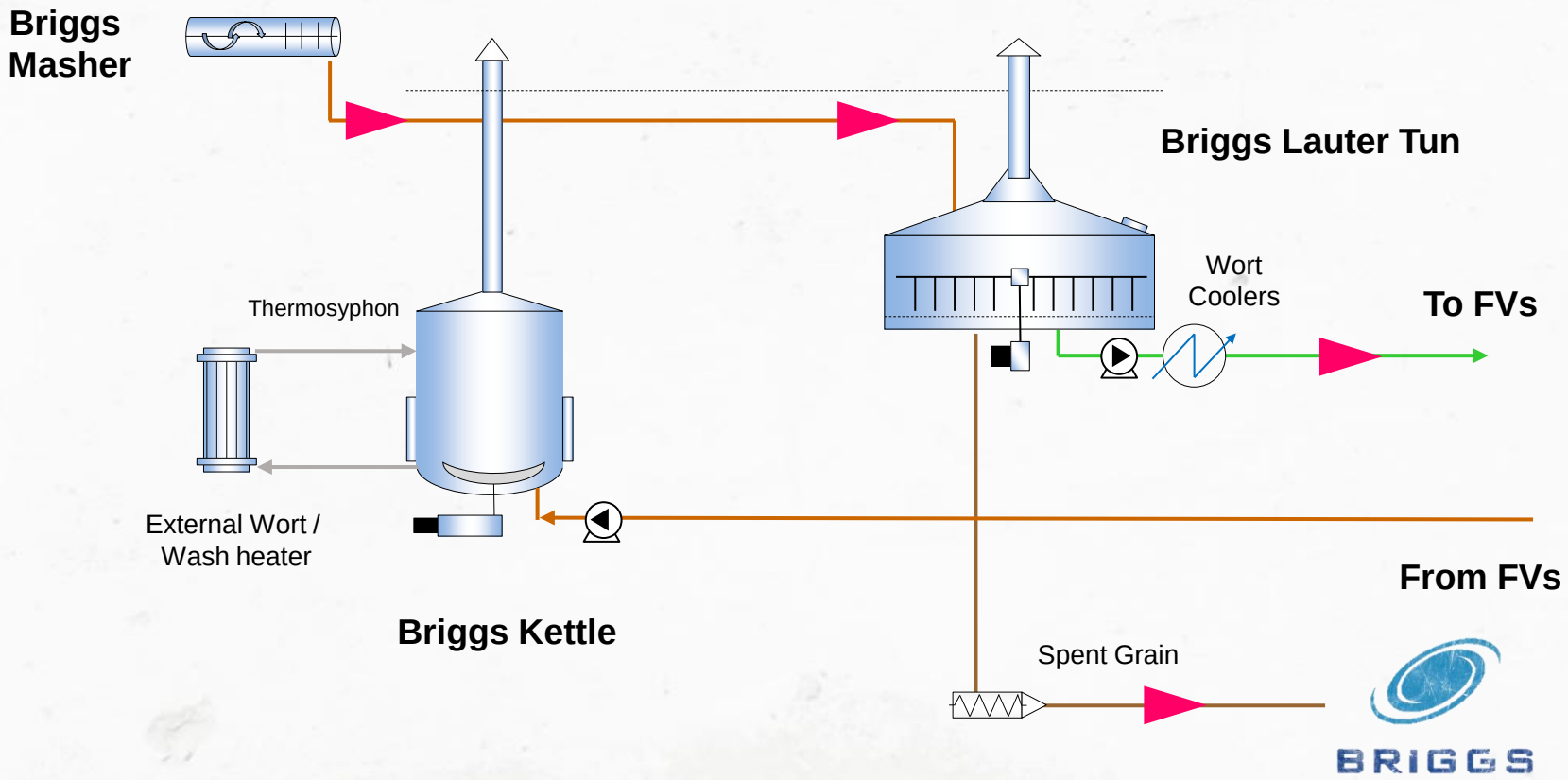
Brewstillery Concept – Whiskies (Irish Style)



Brewstillery Concept – Distillation



Brewstillery Concept – Beer



Summary

Overview

Choice of spirits to make:

- Neutral Spirit Production
  - Vodka
  - Gin
- Whiskies
  - Cereal Cooker and Lauter Tun allows a wide range of whiskies to be produced
  - Similarities between malt whiskey distilleries and breweries
  - Process modifications allow production of both

Questions

- Make your own Neutral Spirit?
- Excess brewery wort, how to integrate into a distillery process?

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Thanks

Any Questions?

Booth #107



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