# **Saving money** in your brewhouse and changing your environmental footprint

Process optimisation in mash conversion and cereal cooking

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BRIGGS

DUPONT

# Our offerings

**At DuPont, we empower the world with the essential innovations to thrive, by discovering and delivering results that matter**

Our global team of researchers and industry experts and the DuPont portfolio of **Brewing enzymes** can help you create new beers and unique beer styles, yet ensure you maximize efficiency, ensure consistency and protect the quality of every brew you make.

**Biosciences.dupont.com/brewing**

**Briggs of Burton specialises in delivering high-quality process engineering for the Brewing industry worldwide.**

Our long heritage in brewing has meant we have delivered many Brewing projects globally.

We have been particularly active in the design, expansion and build of new Breweries in the UK, Americas and Africa.

**briggsplc.com/brewing**

## What is the optimum? Depends upon you – some combination of:

### Operational cost factors

- Raw material
- Energy-costs/ consumption,
- Brewhouse yields
- Use of processing aids (like enzymes)

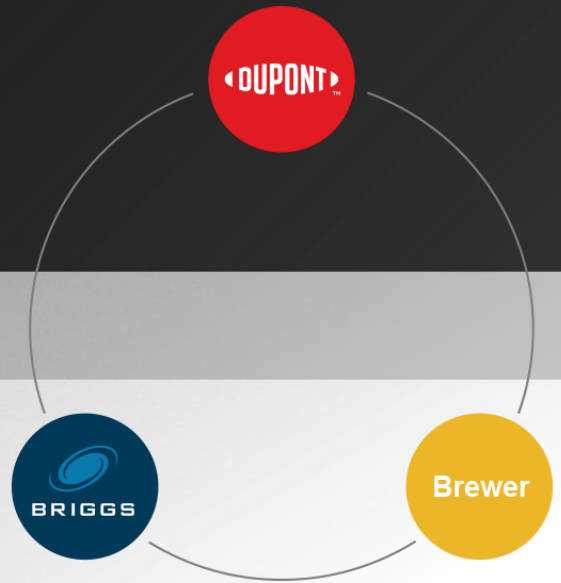
### Investment factors

- Capital cost
- Implementation speed

### Environmental factors

- Carbon footprint
- Sustainability importance

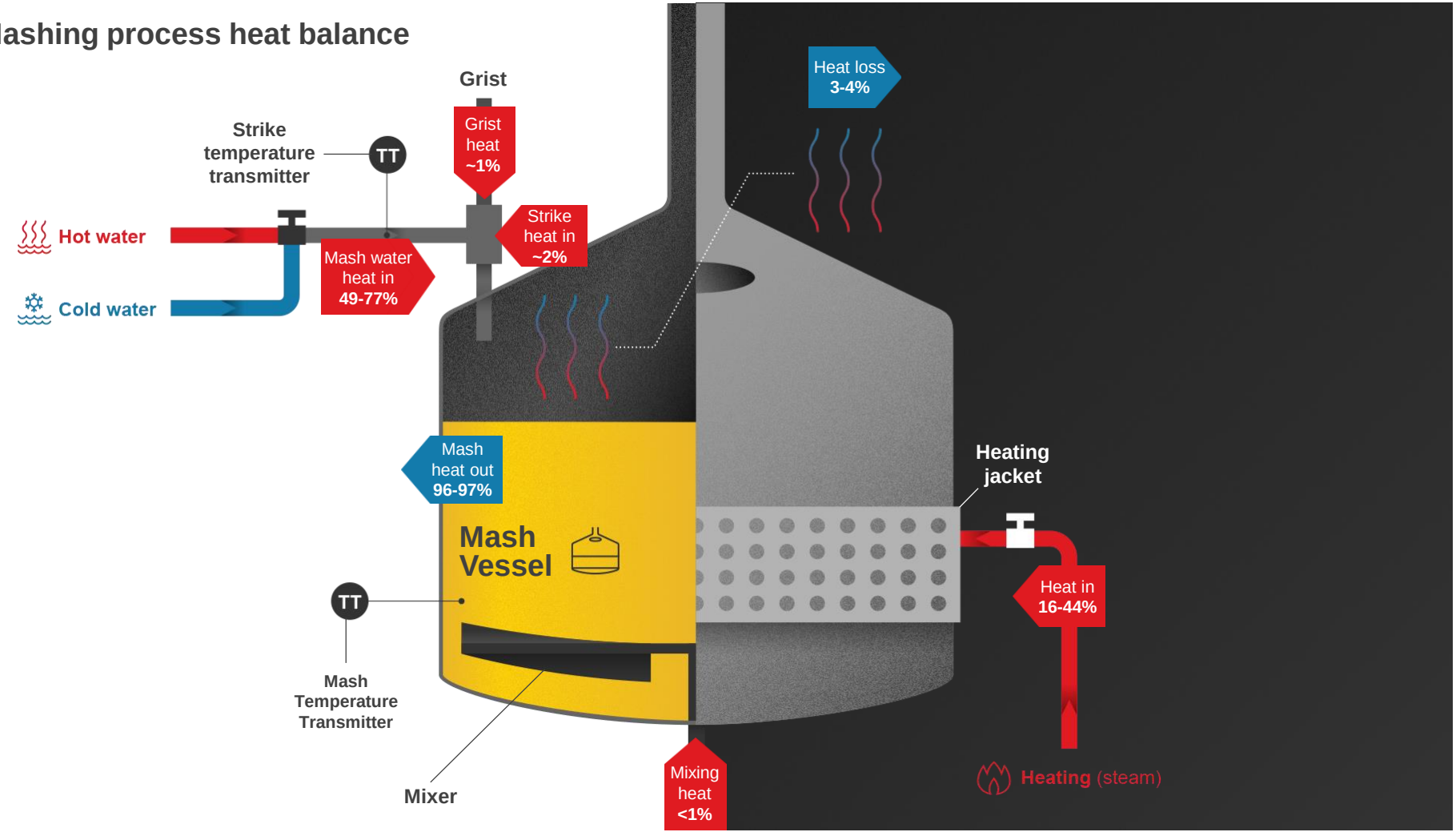
**Different for any particular brewery**



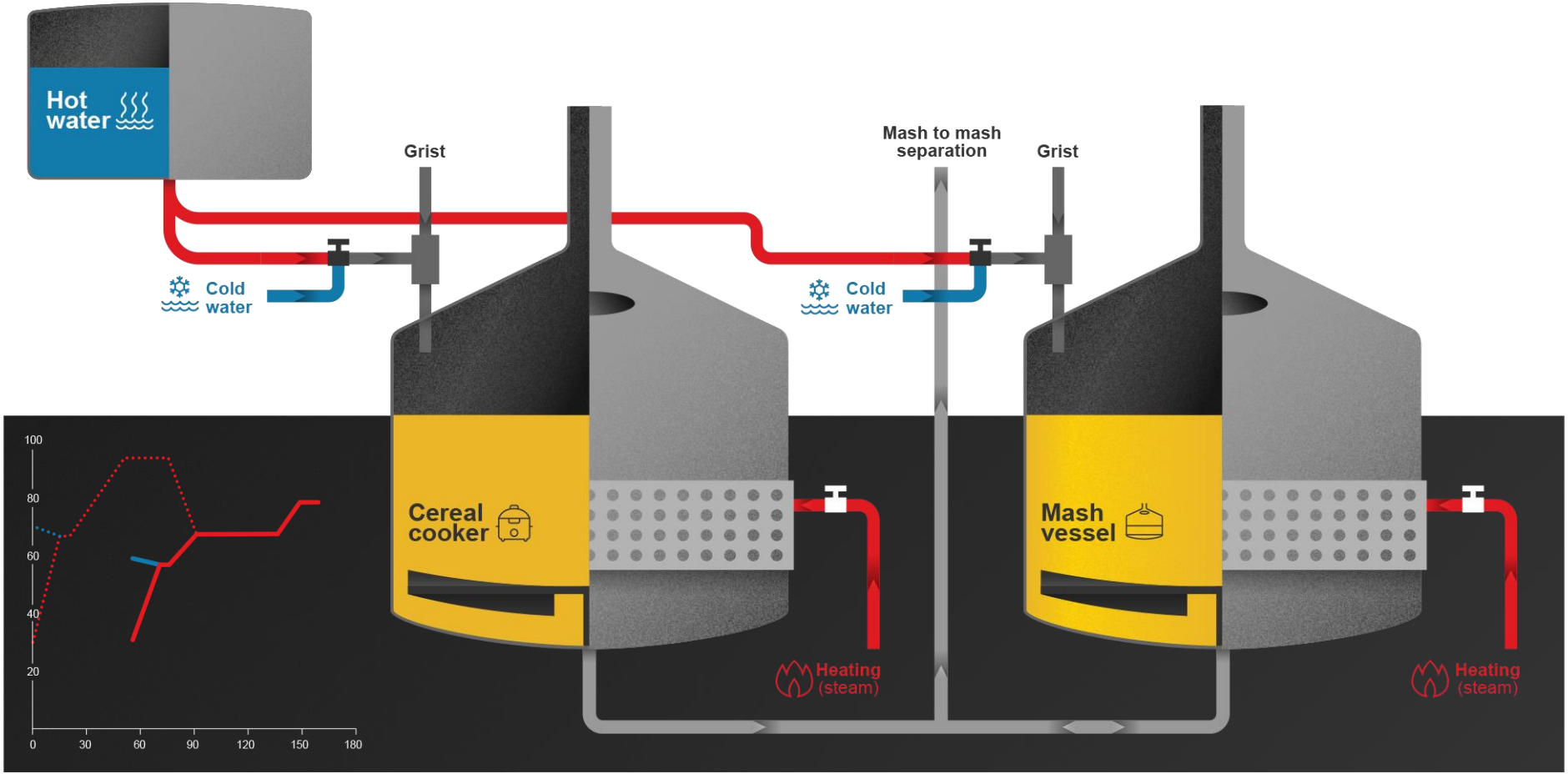

### Common needs

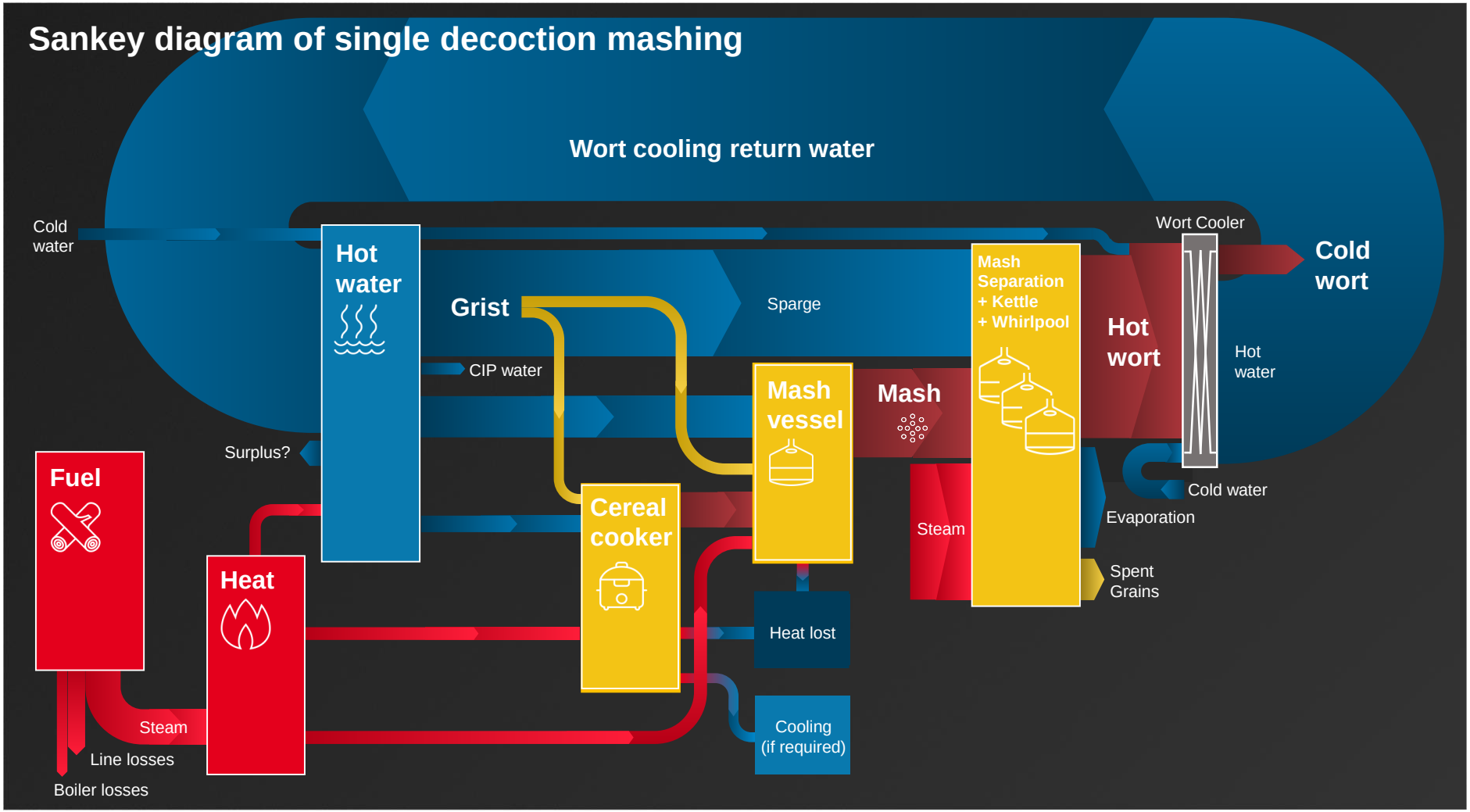
1. Understand energy consumption during mashing / cooking
2. Tool for higher understanding of impact of different raw materials & processes
3. Sharing knowledge and learning together

# Mashing process heat balance



# Single decoction mashing system




Sankey diagram of single decoction mashing
Wort cooling return water
Cold water
Hot water
Grist
Sparge
CIP water
Surplus?
Mash vessel
Mash
Mash Separation + Kettle + Whirlpool
Hot wort
Wort Cooler
Cold wort
Hot water
Cold water
Evaporation
Spent Grains
Steam
Fuel
Heat
Cereal cooker
Heat lost
Cooling (if required)
Steam
Line losses
Boiler losses

# The model

## Compare current case (Control) with an Option

### Mash Profile

- Dynamic simulations allowed
- Visual representation

### Grist composition

- Standard data from database
- Or user specified

### Output

- Visualized in Sankey Diagram
- Energy comparison for Cereal cooking and mash heating
- Relative changes per tonne extract
- Cost change per 1000 hl
- Standard/user fuel costs
- Carbon equivalent changes
- Water usage changes

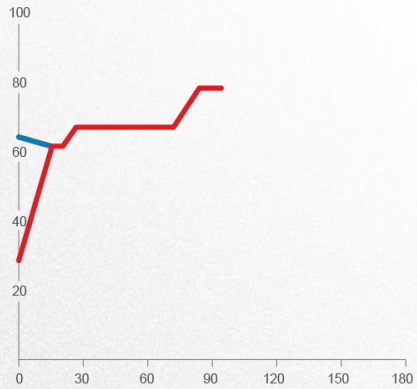
# **Example 1** - All Malt vs Malt : maize-grits (70:30)

## 1. Material

**Barley malt**

**Corn / maize**

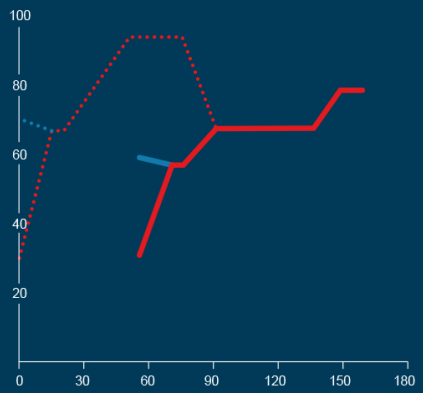
## 2. Control




- All malt
- Classic infusion
- Enzymes for mash separation

Mash vessel profile
Water (mash vessel)
Cereal cooker profile
Water (cereal cooker)

## 3. Option




- Malt + Adjunct (Corn)
- Adjunct cooked at 95°C
- Enzyme addition
- Thick adjunct mash

Mash vessel profile
Water (mash vessel)
Cereal cooker profile
Water (cereal cooker)

## 4. Processing

1. Infusion vs decoction
2. 100% Malt vs 70% Malt / 30% Maize
3. Maize cooked at 95°C

## Outputs:

(1Mhl/year at 15°P OG):

**+ € 8 500 / year of heating cost**

**~ €800 000 raw material saving**

**Cereal cooker required**

**A more sustainable solution**

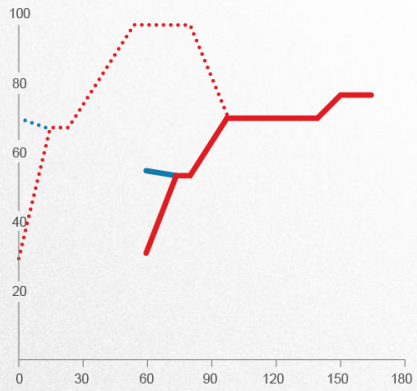
# **Example 2** - Malt/Maize (60:40) (Cooking 99°C v 85°C)

## 1. Material

**Barley malt**

**Corn / maize**

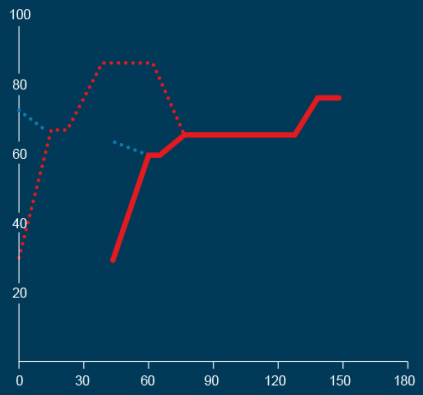
## 2. Control




- Classic Decoction
- Adjunct cooked at 99ºC
- Enzyme addition

Mash vessel profile
Water (mash vessel)
Cereal cooker profile
Water (cereal cooker)

## 3. Option




- Classic Decoction
- Adjunct cooked at 85ºC
- Enzyme addition
- Thicker adjunct mash

Mash vessel profile
Water (mash vessel)
Cereal cooker profile
Water (cereal cooker)

## 4. Processing

1. Different decoction temp. – 99°C vs 85°C
2. 60% Malt / 40% Maize
3. Thicker adjunct mash + Enzymes

## Outputs:

(1Mhl/year at 15°P OG):

**€ 60,000 saving / year of heating cost**

**Lower carbon equivalent (320Te CO2/yr.)**

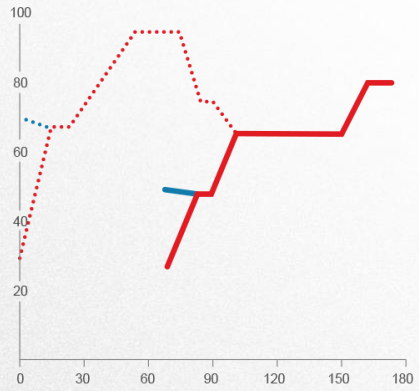
# **Example 3** - Malt/Sorghum (40:60) (Classic v infusion)

## 1. Material

**Barley malt**

**Sorghum**

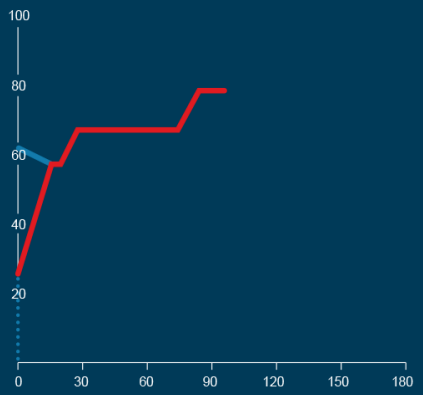
## 2. Control




- Classic decoction
- Cooling through chilled water addition
- Use of enzymes

Mash vessel profile
Water (mash vessel)
Cereal cooker profile
Water (cereal cooker)

## 3. Option




- Single vessel infusion
- Use of enzymes

Mash vessel profile
Water (mash vessel)
Cereal cooker profile
Water (cereal cooker)

## 4. Processing

1. Decoction vs infusion (‘one vessel’)
2. 40% Malt / 60% Sorghum
3. Chilled water cooling & use of enzymes

## Outputs:

(1Mhl/year at 15°P OG):

**€ 73,000 / year Saving on heating/cooling**

**No cereal cooker required**

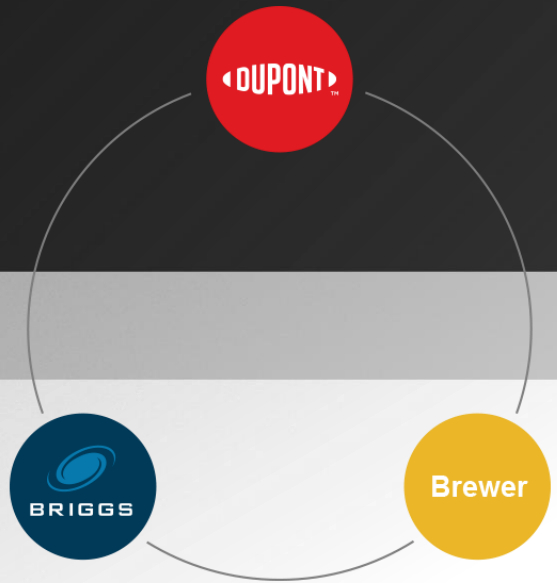
# Conclusions

**Optimum depends on you**

**Using the tool**

- Needs expertise
- Local knowledge/ customisation

**Let's start a dialogue**




**We can support you to**

1. Understand energy consumption during mashing / Cooking
2. Getting a higher understanding of impact of different raw materials, processes and Dupont enzymes!
3. Sharing knowledge and learning together