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MONASH INDUSTRY TEAM INITIATIVE (MITI) 2015-16
IMPROVING MILK TASTE USING INNOVATIVE TECHNOLOGY

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1. BACKGROUND

- UHT milk currently accounts for approximately 15% of milk sales in Australia
- The major complaint in Australia is that UHT milk has a 'cooked' flavour compared to fresh milk
- UHT milk has substantial benefits: it can be transported long distances, it lasts longer and does not need to be refrigerated.
- Approximately 70% of milk consumed in Europe is UHT which indicates that UHT could be a growth industry in Australia

2. SCOPE

- **Improve the flavour of milk products without compromising shelf life**
  - Reducing the heat load of the UHT process
  - Improving heat transfer efficiency for quicker more uniform heating
- **Final product must adhere to the definition of milk**
  - Whey to casein ratio

3. EXPERIMENTAL WORK

Rotary Evaporation

1

Extraction and transfer of fresh flavour to unflavoured UHT products

Microfiltration

2

Separation of bacteria from milk using a membrane

Alternative Heating Technology (AHT)

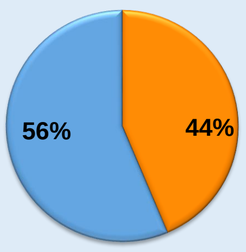
3

Rapid and uniform heating of milk from 67°C to 140°C in 60 s

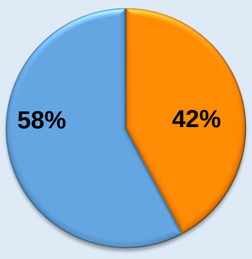
4. RESULTS & ACHIEVEMENTS

I. Rotary Evaporator

UHT flavour extraction
205g sample, 65 °C, 1.5 hours



Fresh flavour extraction
208g sample, 60 °C , 1 hour



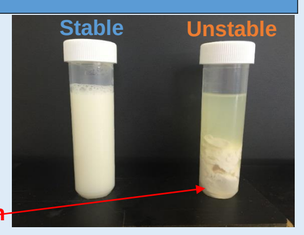
- Successfully optimised the extraction of both flavour from both UHT and fresh milk samples
- UHT milk adopted fresh flavours through the extraction and removal of cooked flavours followed by the extraction and addition of fresh flavours.

II. Microfiltration

Shelf life stability of membrane processed milk samples

Sample	Accelerated storage time		
	0 month	2 months	4 months
MF Tubular 140°C	✓	✓	✓
MF Tubular 130°C	✓	✓	✓
MF Tubular 120°C	✓	✓	✓
MF Tubular 110°C	✓	✓	×
MF Tubular 100°C	✓	×	×
MF Tubular 90°C	✓	×	×
MF PHE 140°C	✓	✓	✓
MF PHE 130°C	✓	✓	✓
MF PHE 120°C	✓	✓	✓
MF PHE 110°C	✓	✓	✓
MF PHE 100°C	✓	×	×
MF PHE 90°C	✓	×	×
Commercial DMG UHT	✓	✓	✓

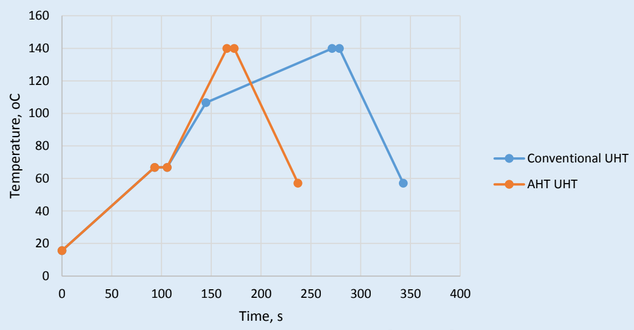
Stable
Unstable



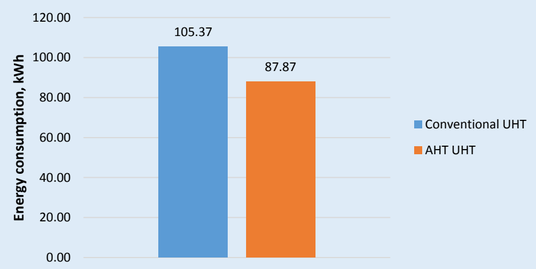
- A reduction in bacteria concentration of 99.93% was achieved by microfiltration
- Successfully produced milk with an extended shelf life of more than 4 months using a lower heat load than typical UHT processing
- Unable to improve flavour dramatically

III. AHT

Temperature time profile of conventional UHT vs AHT UHT



Energy Consumption of Conventional UHT vs AHT UHT



- Time to raise temperature from 70°C to 140°C reduced by 64% using the AHT
- Successfully produced UHT milk with significantly less cooked flavour than commercial UHT milk, with retained fresh flavours
- 16% energy saving per year when using the AHT compared to conventional UHT plant

5. CONCLUSION

- Proof of concept was achieved for all three technologies with each proving to be very promising towards improving milk taste
- The idea behind preserving fresh flavours through reduced heat loads and/or more efficient heat transfer was successfully validated through reduced browning in the samples from each technology.