COOLTUBE

THE WORLD'S **SMARTEST** AND **SMALLEST HEAT EXCHANGE SOLUTIONS** FOR DRINKS DISPENSE.

WITH SO MANY OTHER OPPORTUNITY APPLICATIONS

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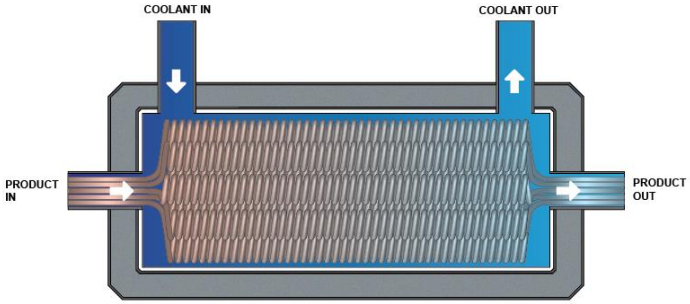
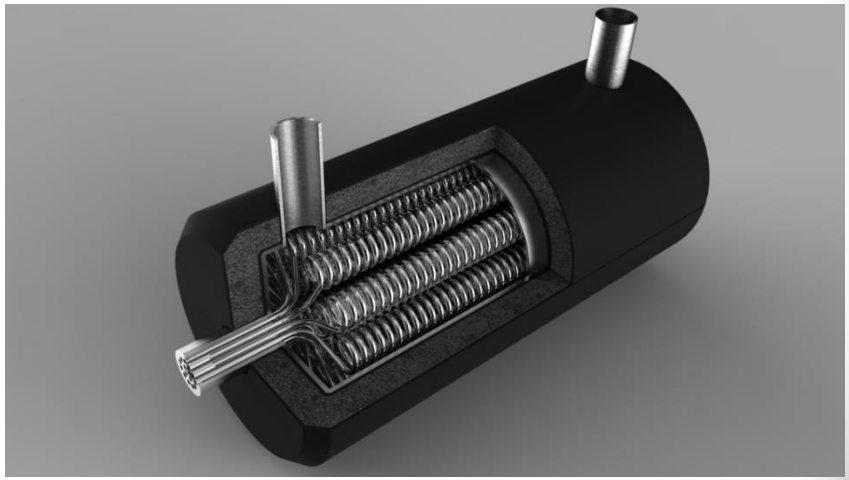
Why am I here

- Primarily to present the CoolTube technology to the group to better understand other market opportunities where the device can be used and or adapted!





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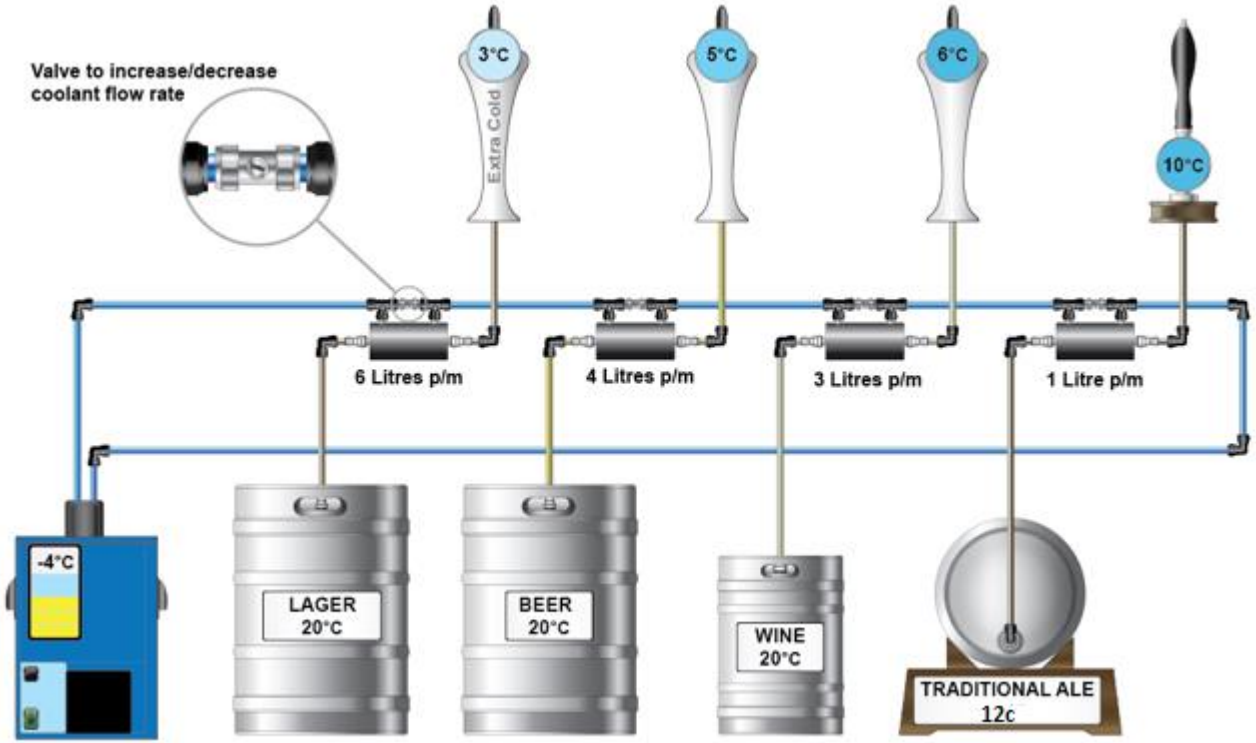
How the CoolTube works with Drinks Dispense



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Modeling & Tech Analysis of the CoolTube

Innovation project 2011

- In April 2011 Brewfitt embarked upon a project in collaboration with Prof. R Mishra in the School of Computing and Engineering at Huddersfield University.
- The project involved using Computational Fluid Dynamics to gain a deeper understanding of the heat transfer processes that occur inside the unique CoolTube.
- A geometrically simplified version of the internal helical coils was used as a model to calculate the temperature, pressure and flow characteristics observed over a cross sectional area of the cool tube.

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Computational Fluid Dynamics

Heat Transfer Coefficient

- Parameters obtained from CFD calculations were used to estimate the overall heat transfer coefficient of the CoolTube.
- The product flow rate was set to 35 ml/s (16 secs/pint) in all CFD calculations.

4Flow flow rate (L/Min)	Overall heat transfer coefficient, U (W m^{-2} K^{-1})
6	3122
9	3151
12	3434

- "The values obtained indicate that the heat transfer values are quite high for this type of configuration" *Professor Rakesh*

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Computational Fluid Dynamics

Effectiveness & Efficiency

- The estimates values of U were used to calculate the effectiveness of the cool tube.
- The effectiveness is a measure of how cool the product out temperature is compared to the lowest theoretically possible temperature.
- As the 4flow is circulated at -4^{o}C through the CoolTube, a heat exchanger that is 100% effective would chill the product to -4^{o}C.

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Computational Fluid Dynamics

Effectiveness & Efficiency

4Flow flow rate (L/Min)	Effectiveness
6	78%
9	80%
12	84%

- “Values in excess of 70% can be considered very good.” *Professor Rakesh*
- The effectiveness can be improved by increasing the flow rate of the coolant however it can be seen that maximum flow rate is not critical for effective performance.
- These effectiveness values can be used to predict the product outflow temperature when the product in temperature is known.

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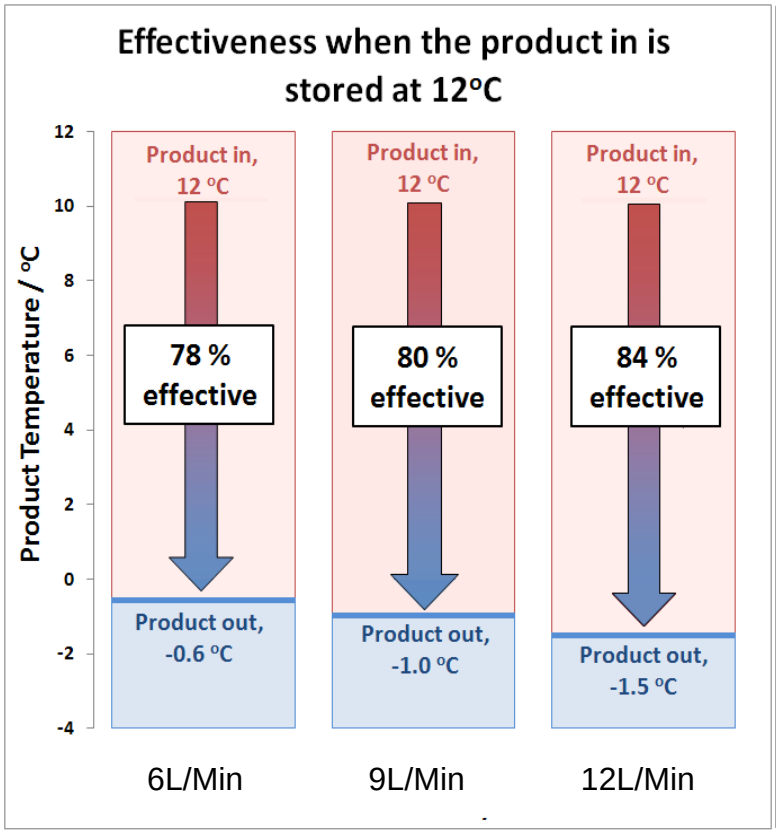
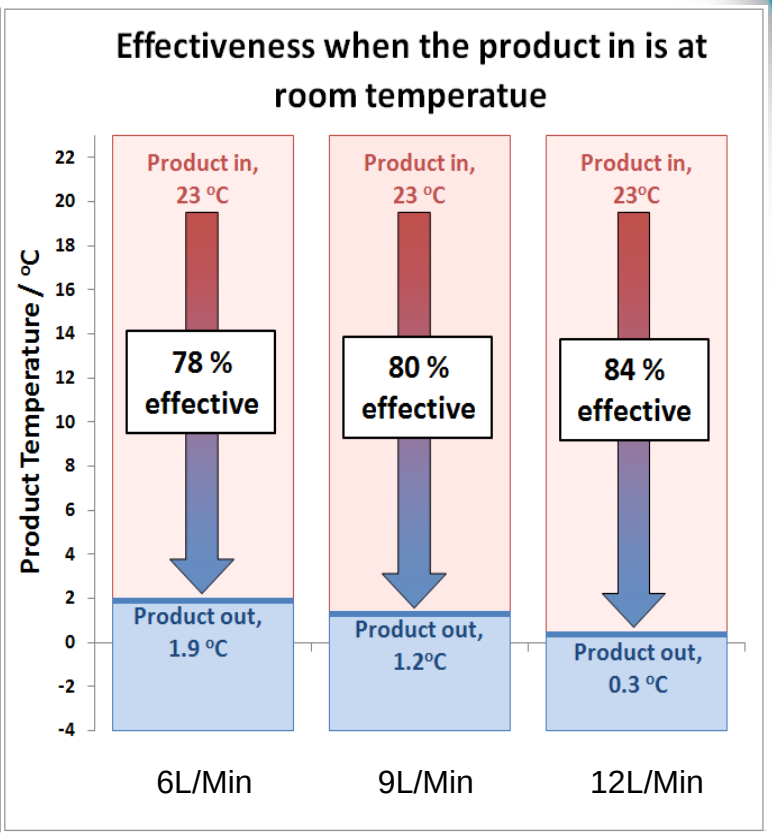
Computational Fluid Dynamics

Product temperature





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Performance Matrix

6 L/Min

Coolant Temp C \ Beer In Temp C	12	15	18	21	24
-4	-0.48	0.18	0.84	1.5	2.16
-2	1.08	1.74	2.4	3.06	3.72
0	2.64	3.3	3.96	4.62	5.28

12 L/Min

Coolant Temp C \ Beer In Temp C	12	15	18	21	24
-4	-1.44	-0.96	-0.48	0	0.48
-2	0.24	0.72	1.2	1.68	2.16
0	1.92	2.4	2.88	3.36	3.84

Following on from the CFD modelling the matrices give a range of beer temperatures achievable by the CoolTube.

The top left matrix shows a system with a coolant flow rate of 6 L/min and the bottom matrix has a coolant flow rate of 12 L/Min

For example: With beer temperature at 12C and coolant temp at 0C, the beer out temperature would be 2.64C for 6 L/min and 1.92C for 12 L/min

Note: All products dispensed at 16 secs/pint

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Thank You

- Q&A’s

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