

# APPLICATION NOTE A001-FP04 - ICE CREAM AERATION

---

APPLICATION NOTE A001-FP04

## ICE CREAM AERATION

**Ice cream is made by freezing and simultaneously blending air into a liquid mixture which contains fat, sugar, milk solids, an emulsifying agent, flavouring and sometimes colouring agents. For ice cream production the aeration process is crucial.**

The air content in ice cream (often called overrun) affects the taste, texture and appearance of the finished product. Higher aeration will produce a tastier and smoother ice cream. Thus, for attaining an optimal structure of the ice cream, production machines must possess an accurate air flow controller that is able to deliver the amount of air necessary to maintain the ratio between cream and air constant, as a function of the cream flow



---

### Application requirements

This method of operation, controlling a gas flow as a function of a measured cream flow, is called a master/slave control loop. Continuous mixer manufacturers require instruments with either analogue or fieldbus (digital) communication features to feed the master flow meter measurement value into the integrated control loop. Combined with the instrument's high performance, this setup will enable a continuous and stable air flow against the required backpressure of the mixer.

### Important topics

- Constant cream aeration
  - Precise dosing
  - Reproducibility
  - Integrated control loop based on direct master flow measurement
  - Stable control
-

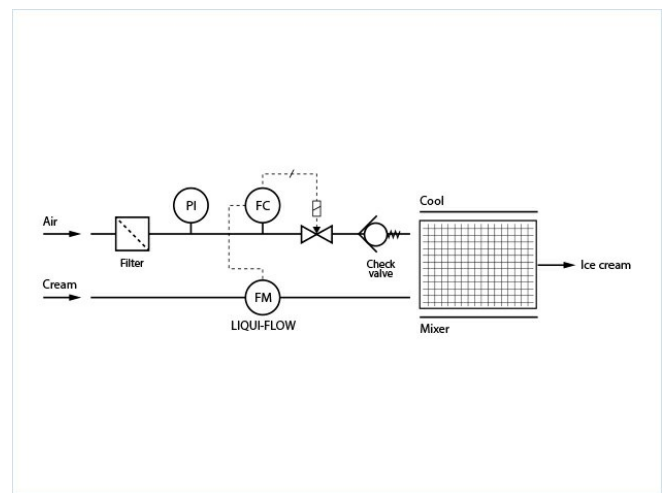
## Process solution

Whipping ice cream into shape. To guarantee the right consistency and structure which ensures a fully flavoured ice cream, the ice cream must contain the correct amount of air bubbles. Hence continuous aeration mixer manufacturers use a mass flow controller to dose an exact amount of air into the cooled mixer.

This mass flow controller operates in slave control mode and by using the real-time cream flow measurement it controls, corrects, and ensures the perfect amount of gas delivery into the process.

System supply and downstream process pressures can influence the aeration process. By implementing a Pressure Meter, fluctuations can be monitored, and with a Pressure Controller also corrected for. Installing an optional check valve downstream of the flow solution protects against liquid entering the instruments caused by an unexpected backpressure.

The Scanning Electron Microscope (SEM) picture below shows the ice cream microstructure. Air bubbles are a critical ingredient. Experts claim its optimal size, distribution and quantity are one of the secrets for having a creamy texture recipe. Hence, according to meet such demands, Bronkhorst has provided efficient solutions for enhancing continuous aeration processes.



Flow scheme with mass flow controllers

## Recommended Products



**EL-FLOW SELECT F-201CV**

Min. flow 0,16...8 mln/min  
Max. flow 0,5...25 lln/min  
Pressure rating 64 bar  
Compact design  
High accuracy and repeatability



**EL-PRESS P-502C**

Min. pressure 2...100 mbar  
Max. pressure 1,28...64 bar  
Absolute or gauge pressure  
High accuracy



**IN-FLOW F-110CI**

Min. flow 0,014...0,7 mln/min  
Max. flow 0,06...9 mln/min  
Pressure rating 100 bar  
Compact IP65 design  
High accuracy



**IN-PRESS P-502CI**

Min. pressure 2...100 mbar  
Max. pressure 1,28...64 bar  
Absolute or gauge pressure  
Compact IP65 design



**BRONKHORST USA INC.**

57 South Commerce Way

Suite 120

USA - Bethlehem, PA 18017

Tel. [+1-610-866-6750](tel:+1-610-866-6750)

[sales@bronkhorstusa.com](mailto:sales@bronkhorstusa.com)