FLOW MONITORING 2017

Mouldflo

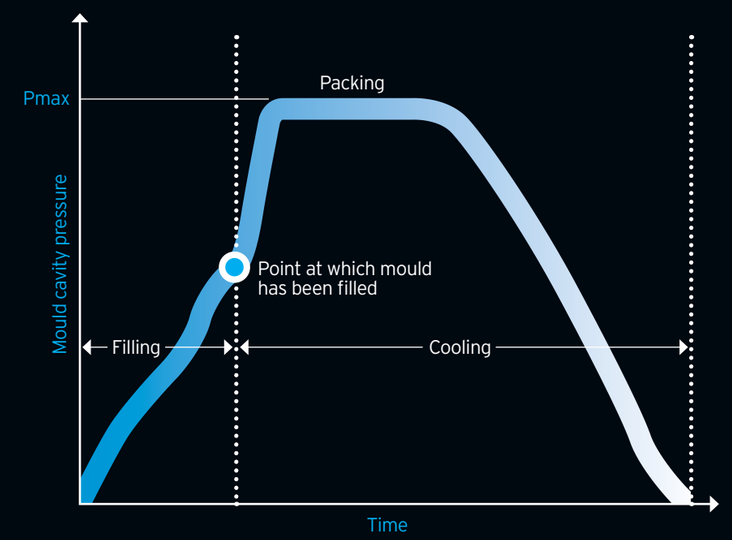
www.mouldflo.com

Contents

4
Mouldflo Monitoring system

13
Mouldflo Test Rig

Cooling is up to 70 % of cycle time



The cooling time is up to 70 % of the total cycle time.

By monitoring the flow, temperatures and pressure you can easily optimize the cooling circuit and improve productivity and reduce scrap.

Mouldflo Flow Monitoring

MEASURE

- → Simple overview
- → Digital monitoring
- → Exact readings
- → Flow
- → Pressure
- → Temperature

PROCESS

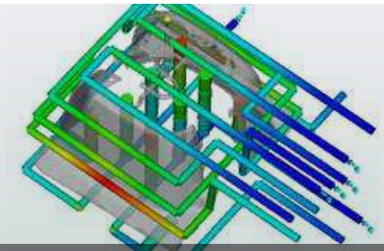
- → Alarm Output
- → Data logging
- → History tracking
- → Industry 4.0 ready
- → Full documentation

IMPROVE

- → Increase productivity
- → Reduce Cycle Time
- → Reduce Scrap
- → Quicker Mould Changes
- → Energy savings

MOULDFLO – OPTIMIZE THE WAY YOU WORK

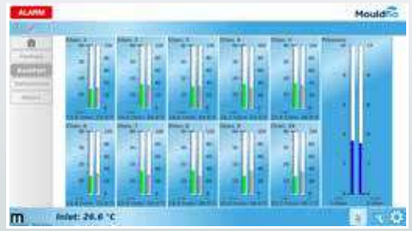
Mould Cooling - lifecycle



1 Mould Cooling Design

Complicated and delicate cooling channels require intelligent cooling regulation.

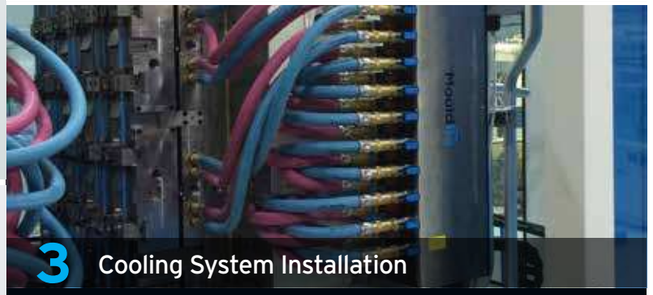
Each cooling channel should have individual flow setting to optimize the heat transfer.



2 Flow setting Optimising

By setting the flow and temperatures individually for each cooling channel you will get the perfect moulding process with shortest possible cycle time and product consistency.

The manifold inlet and outlet pressure sensors are used to validate the cooling circuit setup and will identify pressure loss through the mould.



3 Cooling System Installation

With Mouldflo installed on the moulding machine process engineers are able to monitor that the flow, temperature and pressure within the cooling circuits and trigger an alarm if any of these parameters deviate outside of the alarm limits.

4 Mould Maintenance

Mouldflo will help engineers identify and predict an acceptable maintenance schedule. By analysing the recorded flow information the user can easily see when the cooling channles are becoming blocked and require descaling.

The flow testrig is perfect for testing, measuring and certifying that all flow channels are restored and ready for production.

5 Mould Cooling Design

Achieve the best moulding conditions, by using the flowrig to measure the capacity through the mould and decide optimum pressure and flow.

Print a certificate that the mould is in perfect condition before going back into production.

Mouldflo Flow Monitoring System

Validation

For the first time Mouldflo offers Injection Moulders an affordable solution for monitoring flow and temperature in circuits within an injection mould.

The Mouldflo system will digitally monitor all of the flow circuits within the mould recording data, both flow and temperature, for every circuit.

Often overlooked by many moulders, the efficiency of the mould cooling circuit(s) are critical to a stable process and the manufacturer of high quality, dimensionally stable parts. Mouldflo can protect your mould and improve quality by quickly identifying cooling problems and alerting the user to various common cooling circuit problems, such as:

- No water flow from the mould heater
- Blocked waterways
- Scale / rust build up
- Incorrect piping

Injection moulders currently use a range of methods for distributing and controlling the water flow around the cooling circuit.

Traditionally the most common method has been with water flow regulators. Although cost effective flow regulators suffer from a number of inherent problems:

- Bulky / delicate – have to be mounted away from the mould
- Long pipe runs – reduced flow
- Flow restrictions
- Broken sight glasses
- Do not give a true reading of flow
- Sight glasses unreadable due to oxidation
- High levels of maintenance

More recently there has been a trend towards aluminium manifolds mounted either on the mould, or the platens – this has seen significant benefits with regards to flow – but, generally gives the moulder no visual indication of flow.

Until now it has been both difficult and/or very expensive to measure the flow and temperature of the coolant in each circuit of a mould. Although a process may be fully validated and a process window found during the process development and qualification, it has been impossible to know whether the process is actually running at these settings.

A 50°C setting on the mould temperature controller DOES NOT guarantee that all circuits within the mould are actually running at this temperature or give ANY indication of flow. There may be a partial blockage in a water circuit, or a build-up of scale in the water channels, or even an incorrectly piped mould resulting in no flow at all. In all of these instances the mould temperature controller will still show that the coolant is at the correct temperature, both inside your process window and as per your control plan, but, the reality is that the mould is not operating at this temperature. The ability to monitor and record both flow and temperature, and to make flow adjustments as the process demands, gives increased confidence in the process.

All of the other main parameters of the moulding machine will give you feedback about the process; it will tell you the effect the injection speed is having on the injection time, or how much injection pressure is actually being used, even the actual temperature on each zone of the barrel. But, even though the mould temperature is one of the most important control characteristics in any process validation, until now it has been impossible to tell what is actually happening inside the cooling circuits.

As any good process validator will testify, it is not what the machine is told to do that is important; it is what the machine is actually doing that matters.

Mouldflo
brings affordable flow/temperature circuit monitoring to injection moulders

Software Interface

Touch screen

Using a remote mounted touch screen the system will monitor and display the flow and temperature for every circuit. The information can be displayed in either a graphical or text format. The data is stored in the internal memory, time and date stamped for ultimate traceability. The data can also be displayed in a graphical format in order that the operator can spot any trend in deteriorating performance for any particular flow circuit. The data can be read over an ethernet connection, downloaded onto a USB stick or fed into an external production monitoring system or directly into the injection machine control system.

Warning and alarm limits can be set for flow and temperature to all monitored zones individually. Should a zone deviate from those settings, then both an onscreen warning and a potential free alarm signal can be fed directly to an ancillary device – such as an alarm tower, hot runner controller or the injection moulding machine to warn that the flow has deviated outside of tolerance.

The system is capable of storing multiple mould set-ups on the internal memory which can be quickly loaded when a mould is changed with all the correct set-points for any given mould.

Simple overview

The user can see an immediate overview of cooling circuit status 'at a glance' on a single screen with instant display status alarms should the flow / temperature go outside of tolerance.

Historical data

Historical data recording means that a performance log for each circuit and manifold is stored on the internal memory allowing the user to track the performance and easily identify problems

Event log

Alarm errors, warnings and operator changes are all stored with a time and date stamp and can be reviewed at any time.

VNC Ready

The Mouldflo Flow Monitoring System can be connected to a smartphone or laptop using a VNC protocol. This will allow you to monitor the flow/temperature from any location directly from your device.

Industry 4.0 Ready

It is also possible to feed the data into an external production monitoring system or configure settings by connecting a laptop or directly to the machine controller.

Mouldflo Configuration Guide

S-Line

Full software package

Laptop/PC

Touch Monitor

Machine Control (VNC)

MF-Server Network ready

MFIO interface (Connects up tp 8 manifolds)

Alu manifold

Stainless steel manifold

S-Line

Power supply ensures reliable and correct voltage

Inteface connecting multiple manifolds

Mouldflo Server offers flexible accessibility and unique features

State of the art

The Mouldflo S-Line gives the user the best of all worlds; full flexibility, high performance and many professional features.

Touch Panel Pro

Connect the Mouldflo 15" Capacitive sensing touch panel and experience a quick response and trouble free user interface.

The Touch panel is industrial style and is equipped with VESA standard mounts.

Mouldflo Server

The Mouldflo Server is a compact computer with Mouldflo sofware installed. The compact design makes the unit fit directly inside the electrical cabinet on the Injection Moulding machine.
The integrated VNC (virtual network computing) feature allows easy integration on the machine control, laptop or tablet via Ethernet cable.

- Full software accessibility
- Graphical user interface
- Storing and loading mould settings
- Graphs and historical data
- Event log
- Network ready
- VNC ready
- Monitor flow, pressure and temperature
- Alarm outputs
- USB software update port
- Display port

Hardware

Sensors

The Mouldflo Manifold is equipped with very compact sensors that are capable of reading both flow and temperature. The sensor is based upon the vortex flow measurement principle which uses a bluff body in the middle of the flow path to create small eddy currents (vortices) and the pressure of this current is measured to determine the flow through a given cross sectional area.

The sensors have no moving parts; this, combined with a large flow path, make it ideally suited to mould cooling even when using heavily contaminated water. The sensors are integrated directly into the manifold keeping size to an absolute minimum; the manifold has been designed to create a fixed linear flow path that is essential for accurate flow measurement.

The sensors are available with two flow ranges to suit the application and are held in place with a simple clip which can be easily replaced making maintenance very simple.

Interface module

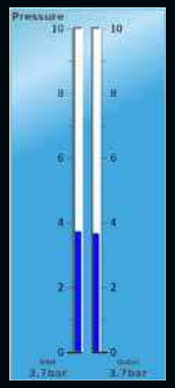
The Mouldflo system is equipped with a DIN-Rail mounted interface module – this is the hub of the system and allows the manifolds to be easily connected to external devices.

The interface module facilitates true 'plug and play', allowing multiple manifolds to be monitored and also enables convenient and simple connection to the touch screen, power supply, alarm signals in/out and machine communications. The module is equipped with USB and ethernet.

The data generated by the Mouldflo system can be fed into production monitoring systems or other ancillary devices such as hot runner controllers or the moulding machine control system using the onboard communication ports.

Pressure Sensors

Optional Pressure Sensors



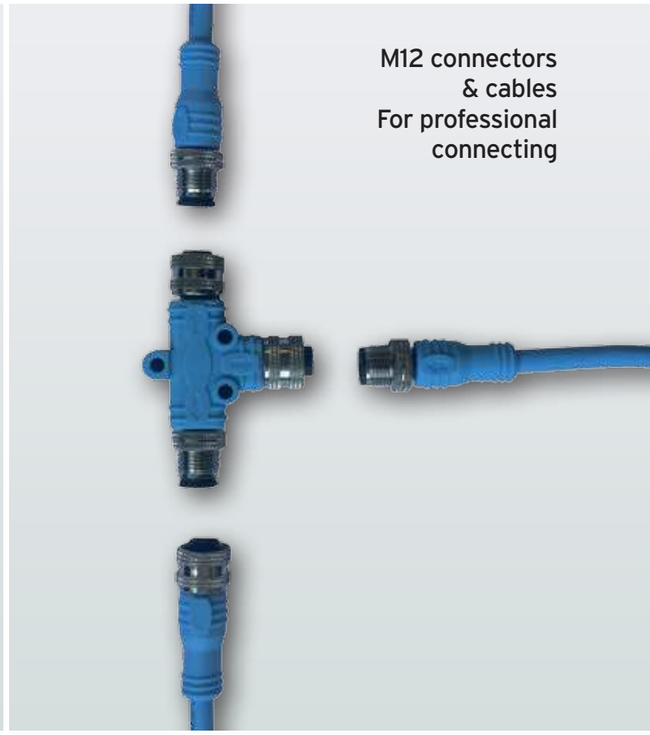
The correct pressure is critical in all flow circuits and with Mouldflo pressure sensors installed in the Manifolds you will monitor both the inlet and outlet pressure.

This feature allows the user to ensure that there is sufficient flow capacity and also identifies and deviation in the water supply.

The difference between inlet and outlet pressure illustrates the total presure loss through the mould which is often caused by incorrect dimensioning of fittings and hoses.

The pressure sensors completes the installation and will ensure full knowledge of your flow circuit and guarantee trouble free function and high productitivy.

Cables and Connectors



M12 connectors
& cables
For professional
connecting

M12 connectors and cables

Mouldflo manifolds and the interfaces are equipped with M12 connectors for easy and professional connecting.

Multiple manifolds can easily be daisy chained and connected to the interface. This will ensure perfect connections and trouble free operation.

Manifolds

Aluminium manifold

Stainless steel manifold

The slimline and compact design has been developed to enable the Mouldflo manifold to be mounted into the smallest space possible next to the machine platens, keeping pipe runs to an absolute minimum; improving flow rates to the mould and reducing cycle times.

The Mouldflo manifold has flow and return ports on both the top and bottom of the manifold. This allows maximum flexibility when connecting to the water supply and means that the same manifold can be used on both the fixed and moving half of the moulding machine. The Mouldflo manifold has ports for the individual circuits as standard and can be supplied with colour coded ball valves and industry standard connector nipples to the customer specification. The Mouldflo manifold is available with 4, 8 or 12 ports as standard.

Multiple manifolds can be electronically 'daisychained' together to accommodate the necessary number of flow channels. The system will automatically identify 'new' manifolds and display them on the screen meaning that the system can be expanded in the future.

Aluminum

Constructed from custom extruded aluminium, the Mouldflo manifold is black anodised to resist corrosion. The extrusion has been designed to accommodate a linear flow path for each of the flow sensors, which is very important for accurate measurement. The manifold has been extruded with integrated slots on two faces to allow for 'roll-in' t-nuts enabling simple and flexible mounting of the manifolds.

Stainless Steel

The Stainless steel manifolds are the prefered choice for clean-room or medical applications.

The Stainless steel manifold is equipped with 1" feed ports and 3/8" circuit ports.

Manifolds

Manifold Aluminium	
Manifold feed	1-1/2" BSP / NPT
Manifold ports	1/2" BSP / NPT
Number of ports	4/8/12 Standard (other sizes on request)
Regulation	Colour coded ball valves per circuit (optional)
Manifold connection	Customer specified - Hasco / DME / Staubli® (optional)
Operating temperature (max)	Standard: 0 - 95ºC. / HiTemp: 0-120 ºC
Operating pressure (max)	4 bar
Temperature sensing	Per circuit (return)
Flow sensing	Per circuit (return)
Temperature sensing main inlet	Yes
Power supply	12 - 24 VDC

Manifold Stainless Steel	
Manifold feed	1" BSP
Manifold ports	3/8" BSP or 1/2" BSPT / NPT
Number of ports	4/8/12 Standard (other sizes on request)
Regulation	Colour coded ball valves per circuit (optional)
Manifold connection	Customer specified - Hasco / DME / Staubli® (optional)
Operating temperature (max)	Standard: 0 - 95ºC. / HiTemp: 0-120 ºC
Operating pressure (max)	4 bar
Temperature sensing	Per circuit (return)
Flow sensing	Per circuit (return)
Temperature sensing main inlet	Yes
Power supply	12 - 24 VDC

Flow sensor	
Sensor type	Vortex
Range (flow)	2-40 litres/min or 1-15 litres/min
Accuracy (flow)	1.5% fs
Range (temperature)	Standard: 0 - 95ºC. / HiTemp: 0-120 ºC.
Resolution (temperature)	0.5ºC
Accuracy (temperature)	+/- 1,5% fs
Sensor signal	0,35 - 3,5 V
Output signal	Voltage
Response time	< 1 s
Power supply	5 VDC
Seal	EPDM
Burst pressure	18 bar (40 ºC)
Connection	Quick connect - plug and play

Flow sensor	
Sensor type	Vortex
Range (flow)	2-40 l/min or 1-20 litres/min
Accuracy (flow)	1.5% fs
Range (temperature)	Standard: 0 - 95ºC. / HiTemp: 0-120 ºC
Resolution (temperature)	0.5ºC
Accuracy (temperature)	+/- 1,5% fs
Sensor signal	0,35 - 3,5 V
Output signal	Voltage
Response time	< 1 s
Power supply	5 VDC
Seal	EPDM
Burst pressure	18 bar (40 ºC)
Connection	Quick connect - plug and play

Dimensions	Width	Height
	180 mm	124 mm

Dimensions	Width	Height
	160 mm	115 mm

No. of ports	Total length (A)	Ports
4	225 mm	1/2" BSPP female
8	425 mm	1/2" BSPP female
12	625 mm	1/2" BSPP female

No. of ports	Total length (A)	Port size 1-20 l/m	Port size 2-40 l/m
4	220 mm	3/8" BSPP female	1/2" BSPT male
8	420 mm	3/8" BSPP female	1/2" BSPT male
12	620 mm	3/8" BSPP female	1/2" BSPT male

Mould Maintenance

Moulds must be maintained regulary to remove scale and rust and ensure maximum productivity

Scale build-up
Mould cooling curcuits are exposed to scale build up, which will reduce flow capacity dramatically and also act as an insulator causing moulding problems due to increasing temperatures.

Eventually the cooling channels will block and stop production.

Flow, temperature and pressure test
With the Mouldflo Test Rig, the cooling channels can be analysed and tested.

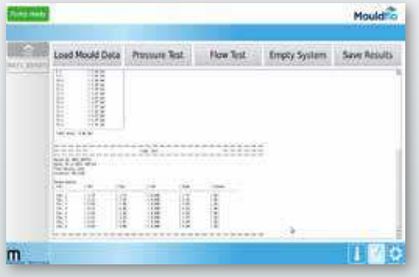
The flow and pressure can be controlled exactly to simulate the production setup.

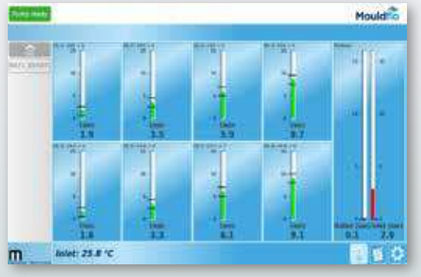
All details displayed on the screen:
- Flow
- Pressure Inlet
- Pressure Outlet

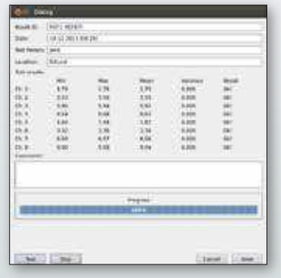
Integrated Pump
The internal dynamic pump will give a calibrated flow and pressure, fully defined and controlled on the Touch Screen.

Dynamic testing of:
- Flow volume
- Back pressure/ pump pressure
- Leaks

Measurement Report







Before shipping the finished mould to the customer the mouldmaker is able to generate a full report with printed documentation certifying all of the flow and pressure characteristics within the mould.

Following data can be recorded:

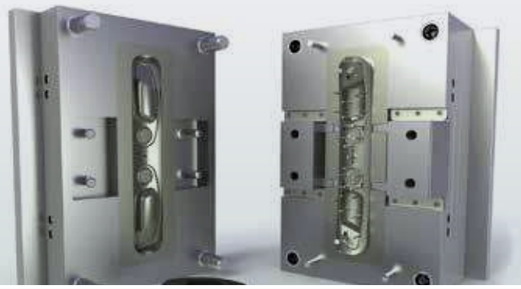
- **Flow volume/capacity**
- **Pressure loss through the Mould**
- **Pressure Leak Test**

Drain the mould in seconds

After testing and certifying the mould, a convenient feature allows you to air purge the water out of all channels, simply by pushing the “empty system” function.

Cooling Channel Optimisation

For the first time Mouldflo offers mouldmakers a unique way to configure and benchmark cooling circuits within the mould



Mouldmakers must often supply new moulds to the customer complete with a report of operating parameters which should include data relating to the cooling circuits in the mould. Now mouldmakers can easily connect the Mouldflo Test Rig to the mould as part of the benchmarking process.

High performance

The unit is equipped with the high quality controllable pump. All parts are carefully selected to meet the highest standards of quality and performance.

The unit can be equipped with water change function, to ensure clean water at all times.

Technical specifications

Manifold	
Manifold feed	1-1/2"BSP
Manifold ports	1/2" BSP
Number of ports	8 Zones (other sizes on request)
Regulation	Colour coded ball valves per circuit (optional)
Manifold connection	Customer specified - Hasco/DME/Staubli® (optional)
Operating temperature (max)	0 - 95ºC
Operating pressure (max)	4 bar
Temperature sensing	Per circuit (return)
Flow sensing	Per circuit (return)
Temperature sensing main inlet	Yes (optional)
Power Supply	24 VDC

Flow sensor	
Sensor type	Vortex
Range (flow)	2-40 litres/min or 1-15 litres/min
Accuracy (flow)	1.5% fs
Range (temperature)	0 - 95ºC
Resolution (temperature)	0.5ºC
Accuracy (temperature)	+/- 1,5% fs
Sensor signal	0,35 - 3,5 V
Output signal	Voltage
Response time	< 1 s
Power supply	5 VDC
Seal	EPDM
Burst pressure	18 bar (40ºC)
Connection	Quick connect - plug and play

Control	
Display	15" touch screen
Control	Microprocessor based / computer based
Comunication ports	Ethernet / USB
Storage (log and settings)	Internal (optional) / USB (optional)
Number of zones (flow and temperature)	Max 8 Zones
Display units (flow)	Litres / gallons switchable
Display units (temperature)	ºC / ºF switchable
Warning limits	10% of alarm limits (optional)

Pump and Tank	
Pump Capacity	Up to 160 l/m
Pump Pressure	0-4 Bar
Power supply	380V., 50Hz, 2500W
Tank Capacity	60 l.

Shipping Address:
Maaloev Vaerkstedsby 69-72
DK-2760 Maaloev
Denmark

Mouldflo

Baltorpbakken 10 · DK-2750 Ballerup · Denmark
Telefon: +45 7020 3131 · Fax: +45 7020 3151

www.mouldflo.com