

APPLICATION NOTE A091-FP02 - BETTER CONTROL OF MICROBIOLOGICAL PROCESS

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Yoghurt, cheese, wine, beer, bread ... what do these foods and drinks have in common? Already for thousands of years, humans have utilised the metabolism of tiny micro-organisms as an essential part of their processing such as brewing and fermentation, showing that biotechnology is of all times used.

Today, more than ever, enzymes and micro-organisms are being used to increase the sustainable production of pharmaceuticals and (bio)chemicals. Researchers in institutes or the industry want to know under which conditions these biological cells grow faster or slower.

What is the influence of nutrients or additives? In order to understand and investigate the underlying biological processes, a German research institute asked Bronkhorst Deutschland Nord to support them with stabilising the process conditions of such a microbiological process.



Application requirements

To investigate under which conditions a population of micro-organisms is able to grow when varying one typical parameter, the other parameters such as temperature, pressure and nutrient concentration need to be kept constant. To that end, the liquid levels of two reactor vessels containing these micro-organisms, which are part of a circulating system, need to be accurately kept at a stable, constant value.

Important topics

- Accurate, steady flow of aqueous liquid
 - Stable liquid level
-

Process solution

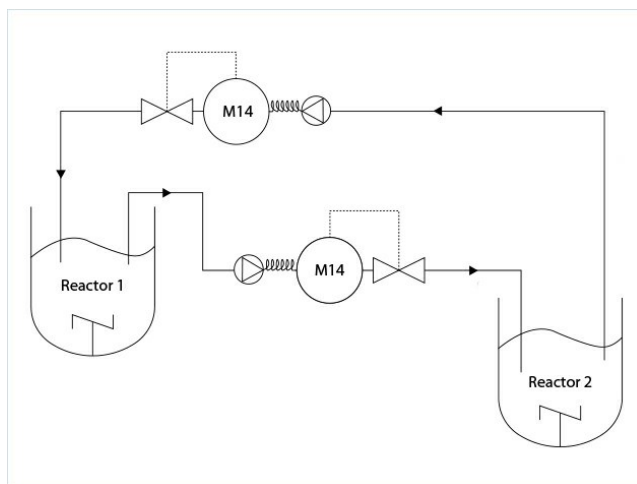
For the recirculation system with two vessels as designed by the research institute, Bronkhorst supplied two Coriolis mass flow controllers (series [mini CORI-FLOW M14](#)). Each of them was inserted on two locations in the circulation system in between the vessels, as can be seen in the process scheme, with the aim to provide a continuous flow of aqueous liquid.

The researchers allowed the micro-organisms to grow in the main reactor of approx. 1 liter in an aqueous environment. For determining the cell growth rate, they took samples from the main reactor at regular intervals. Temperature is an important parameter. Too low temperatures will refrain cells from growing, and too high temperatures are detrimental to the cells themselves.

The Coriolis mass flow controller - mini CORI-FLOW [M14](#) (with [C5I](#) control valve) - gives a signal to a control unit which controls a pump. So the mass flow controller indirectly controls the pump. The liquid goes from the main reactor to a second reactor with a volume of about 200 ml, and from there it will be pumped with a second flow controller/pump combination back to the main reactor. It is a continuous circulation, day and night, and it should go steady. As both flow controller/pump combinations have the same capacities, the levels in both vessels remain at the same, stable value. The setpoints are established by a control unit of the research institute.

Before contacting Bronkhorst, the research institute didn't know how to make the relatively low aqueous stream between the vessels - in the range of 30 to 200 ml/min - flow steadily, day in, day out, without emptying one of the vessels.

In order to keep the 3 μm sized micro-organisms alive and without any damage during the circulation, gear pumps with small spaces between the gears could not do the job, and Bronkhorst advised to apply peristaltic hose pumps - which were used.



Flow scheme

Recommended Products



MINI CORI-FLOW™ MXX

Min. flow 0,05...5 ml/h
Max. flow 3...300 l/h
Pressure rating up to 200 bar
High accuracy, fast response
Density and temperature output



SERIES C2I, C5I

Liquid Flow Valves

Direct acting valve
Pressure rating 64/100 bar
Kv-max: 6.6×10^{-2}



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