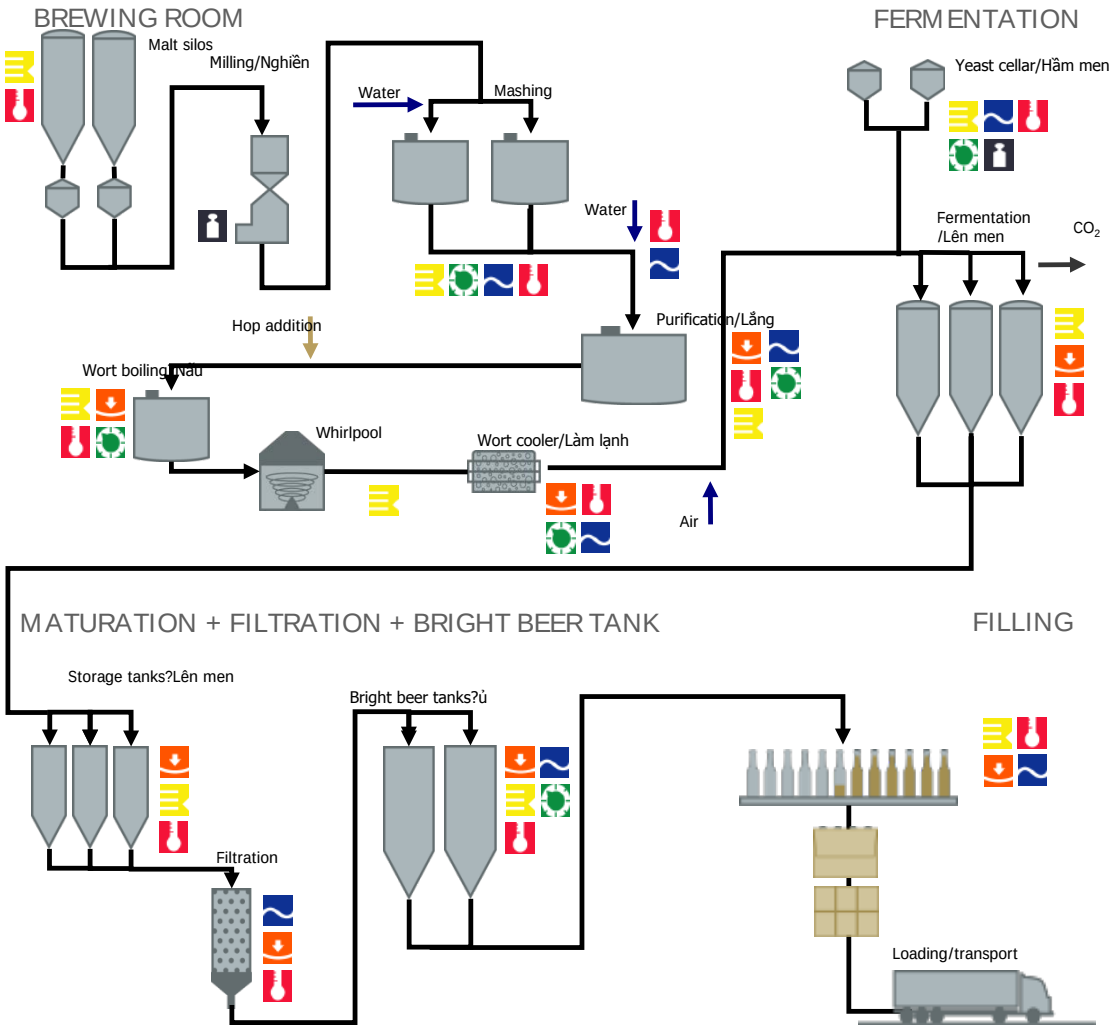
Applications in Breweries

The Brewing Process



The basic steps of the brewing process are:

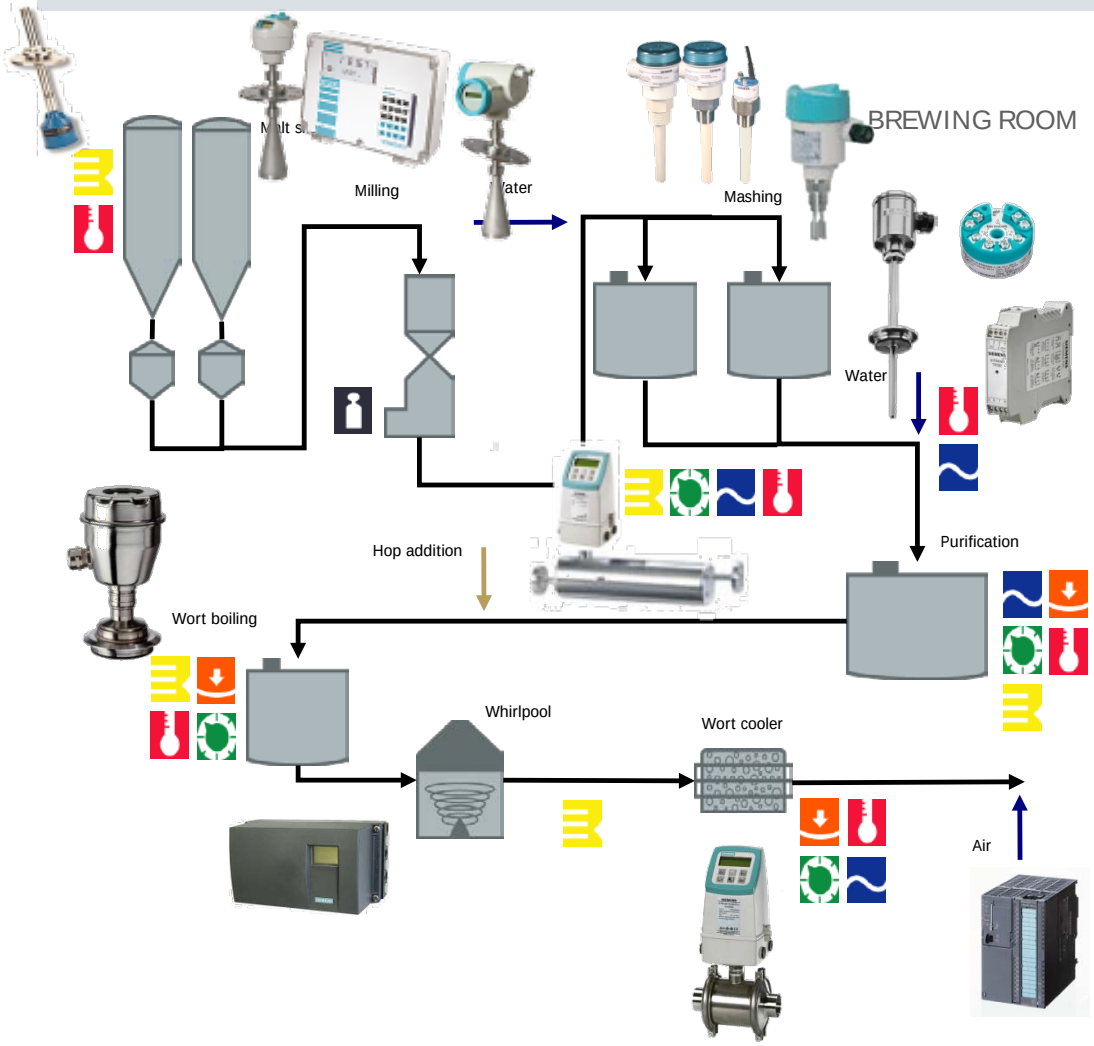
- **Malt milling**
- **Wort production**
- **Fermentation, maturation and yeast propagation**
- **Filtration, carbonization and bright beer storage**

Breweries require auxiliary process steps as water treatment, cooling and CIP systems, pneumatic systems but also CO_2 accommodation

Physical values to be measured:

- **Flow**
- **Pressure**
- **Temperature**
- **Level**

Applications in the brew house



Limit switch:

Sitrans CLS, LVS, LPS, LVL

Level:

- Hydrostatic:

Sitrans P300, DSIII, P310

- Radar:

Sitrans LR260 and LR460

Ultrasonic:

Sitrans LU01/02/10
with sensors XPS 30/40

Flow:

Sitrans FM MAG 1100F,
Sitrans FM MAG3100
Sitrans FC

Pressure:

Sitrans P300, P310

Temperature:

Pt100 with Sitrans TS500
or Sitrans TR

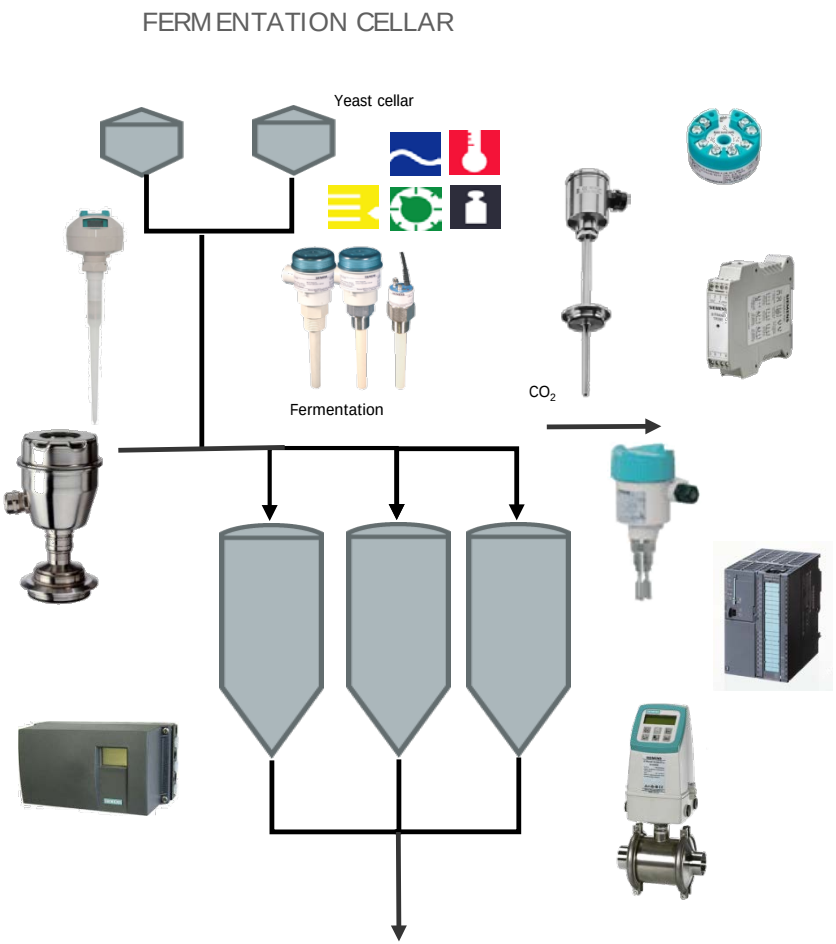
Positioner:

Sitrans PS2

Weighing:

Siwarex

Applications in fermentation



Limit switch:

Sitrans CLS, LVL

Level:

- Hydrostatic:

Sitrans P300, DSIII

- Radar:

Sitrans LR200 and **LR300**

Flow:

Sitrans FM MAG 1100F
Sitrans FC

Pressure:

Sitrans P300

Temperature:

Pt100 with Sitrans TH
or Sitrans TR

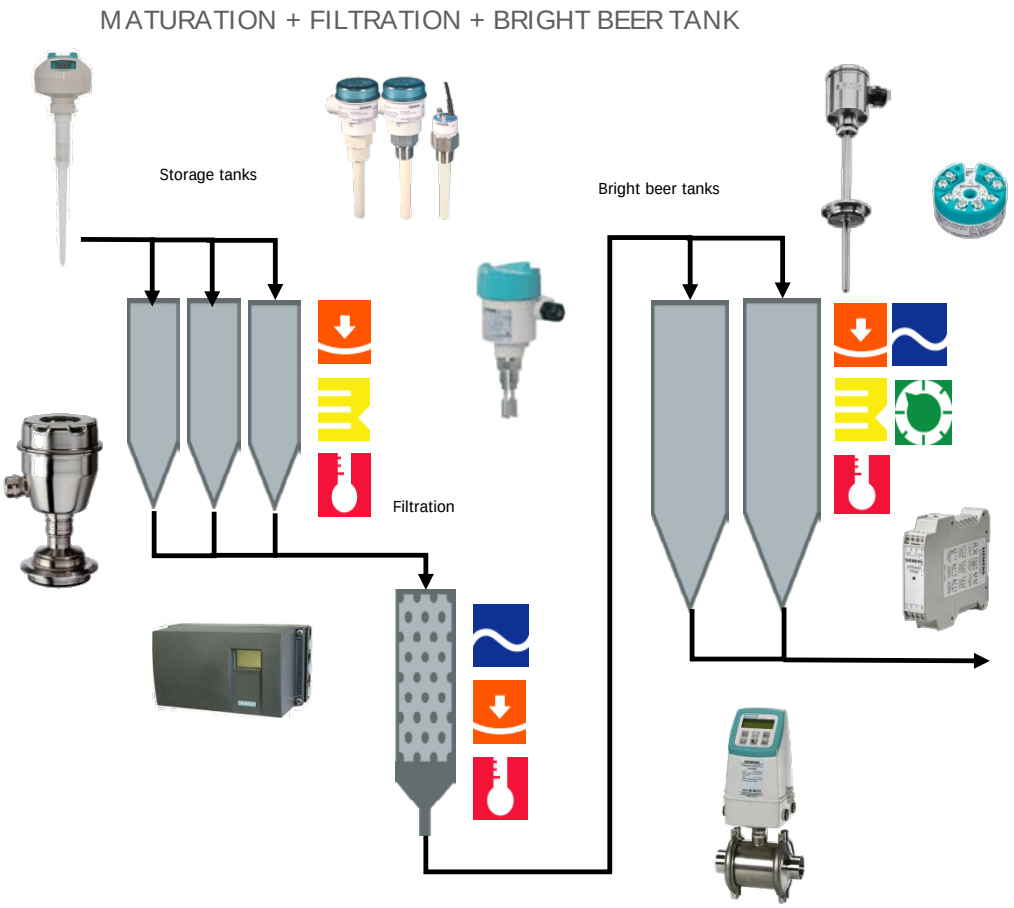
Positioner:

Sitrans PS2

Weighing:

Siwarex

Applications in maturation and filtration



Limit switch:

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Level:

- Hydrostatic:

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- Radar:

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Flow:

Sitrans FM MAG 1100F
Sitrans FC

Pressure:

Sitrans P300

Temperature:

Pt100 with Sitrans TH
or Sitrans TR

Positioner:

Sitrans PS2

Level measurement

Hydrostatic level measurement

Digital transducer with front flush membrane

Low drift and high precision

High Turn Down Ratio (1:100)

IP 68

EHEDG approval

Continuous level measurement at grain or malt silos increases production flexibility

SITRANS LU

A compact and easy to install device for up to ten measurements with one transmitter for silos up to 20 m. High performance at an reasonable price.

SITRANS LR 260/460

24 GHz radar devices for continuous measurement for silo heights up to 30, resp. 100 m for high performance requirements in solids.

Flow measurement

MAGFLO MAG1100 Food

Magnetic – inductive flow meter with SENSORPROM and flexible communication (HART, PROFIBUS DP & PA, MODBUS, DeviceNet)

- ✓ **Liners (ceramics (Al_2O_3) or PFA)**
- ✓ **Accuracy (0,25 % of actual flow value)**
- ✓ **Measuring uncertainty (+/- 0,5 % actual flow value)**
- ✓ **Approvals (3A, EHEDG for ceramics)**

MASSFLO MASS 2100

High performance Mass Flow Meter (Coriolis) with SENSORPROM Technology and flexible communication (HART, PROFIBUS DP & PA, MODBUS, DeviceNet)

- ✓ **Range (0 – 52.000 kg/h)**
- ✓ **Accuracy (0,1 % of actual flow)**
- ✓ **Added value (measuring of density and temperature)**

Weighing technology

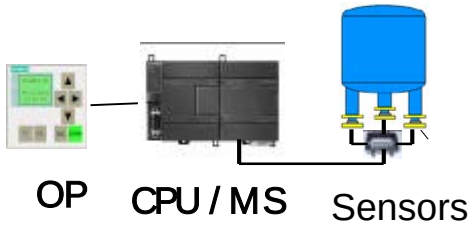
Malt weighing hopper

Solid flow meter

Continous dosage of 50 kg malt at a daily capacity of 200 t with full integration in the SIMATIC S7 and PCS 7

- ✓ **Metering deviation of complete system < 10 g**
- ✓ **Batch error < 20 g**
- ✓ **450 batches per hour**
- ✓ **Direct integration in S7 or PCS 7**

”Solid Flowmeasurement” based on SIEWREX weighing technology using an existing deflector system



Temperature measurement & positioner

Resistance thermometer

with 1x or 2x Pt100 class A, 3-wire for installation in pipes and tanks or non insertion type clamp-on thermometer

Positioner

- **Electro pneumatic positioner SIPART PS2 for control valves, for linear and part turn actuators**
- **Time efficient automatic commissioning functionality, diagnostic functionality for valves and actuators**
- **Split installation for extreme ambient conditions**
- **Cost saving by minimized air consumption**

Case Study Plato Measurement

Metering in the Brewhouse
SITRANS F C MASSFLO mass flowmeter

food & BEVERAGE

In-line, temperature-independent Plato meters, connected directly to the brewery's process computer, allows control what will optimize the brewing process.

SIEMENS

Introduction to in-line Plato measurement

In the brewhouse, wort concentration is traditionally controlled by measuring gravity, at a well-defined temperature, with a hydrometer.

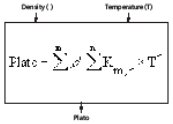
Several measurements are taken during the boiling process. Prior to fermentation, a final water adjustment to the wort concentration may be necessary.

There is uncertainty associated with this manual method of measurement due to evaporation and each brewer's way of performing the measurement. Furthermore, brewing capacity is wasted in boiling to a concentration higher than the target value with a subsequent water adjustment.

Lautering can be optimized when an in-line Plato meter is included in the lauter tun runoff to control sparging. The sparging process can be stopped when the wort concentration has dropped to a level where transfer to the wort kettle is no longer desirable. An in-line Plato meter can also identify channelling which causes the yield of the lauter tun to drop.

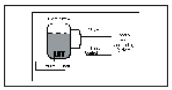
Continuous monitoring is possible with the addition of an in-line Plato meter in a closed loop on the wort kettle. The boiling process can be stopped at the exact target value, resulting in higher brewing capacity and better quality of the end product.

In-line measurement vs manual measurement



SITRANS F C MASSFLO internal Plato calculation

- SITRANS F C MASSFLO measures the density and temperature of the wort.
- To each pair of density and temperature values corresponds an exact wort concentration. This relationship has been developed in an algorithm, which is programmed into SITRANS F C MASSFLO.
- The °Plato algorithm enables SITRANS F C MASSFLO to measure the wort concentration at the actual process temperature. No cooling prior to measurement is necessary.



Installation for monitoring the wort kettle

SITRANS F C MASSFLO should be placed in a closed loop on the brew kettle. The same pump used for whirlpooling can be used to force circulation.

Digital communication, or a 4 - 20 mA signal, can be used to connect SITRANS F C MASSFLO to the control and monitoring system. This enables automatic heat transfer adjustments to the wort kettle and, when the target concentration has been reached, automatic cessation of heating.

Installation for monitoring sparge water

SITRANS F C MASSFLO should be placed in the run-off of the lauter tun.
Digital communication, or a 4 - 20 mA signal, can be used to connect SITRANS F C MASSFLO to the control and monitoring system.
This enables automatic stopping of sparging when the target concentration drops to the minimum level.

Total Extract calculation

Total extract can be easily calculated in the control system. Real-time Plato and mass flow measurements are multiplied and then integrated in the control system to measure total extract. This can be used at any location in the brewhouse to track yield and identify process problems.

SITRANS F C MASSFLO Specifications

Meter size	½"	1"	1½"	2"	
Connections Tri-Clamp	1"	1-½"	2"	2",3"	
Flow accuracy[1)]	0.1%	0.1%	0.1%	0.1%	of rate
Flow repeatability[1)]	0.05%	0.05%	0.05%	0.05%	of rate
Density accuracy[1)]	0.0005	0.0005	0.0005	0.0005	g/cc
Density repeatability[1)]	0.0001	0.0001	0.0001	0.0001	g/cc
°Plato accuracy[1)]	0.1	0.1	0.1	0.1	°Plato
°Plato repeatability[1)]	0.05	0.05	0.05	0.05	°Plato

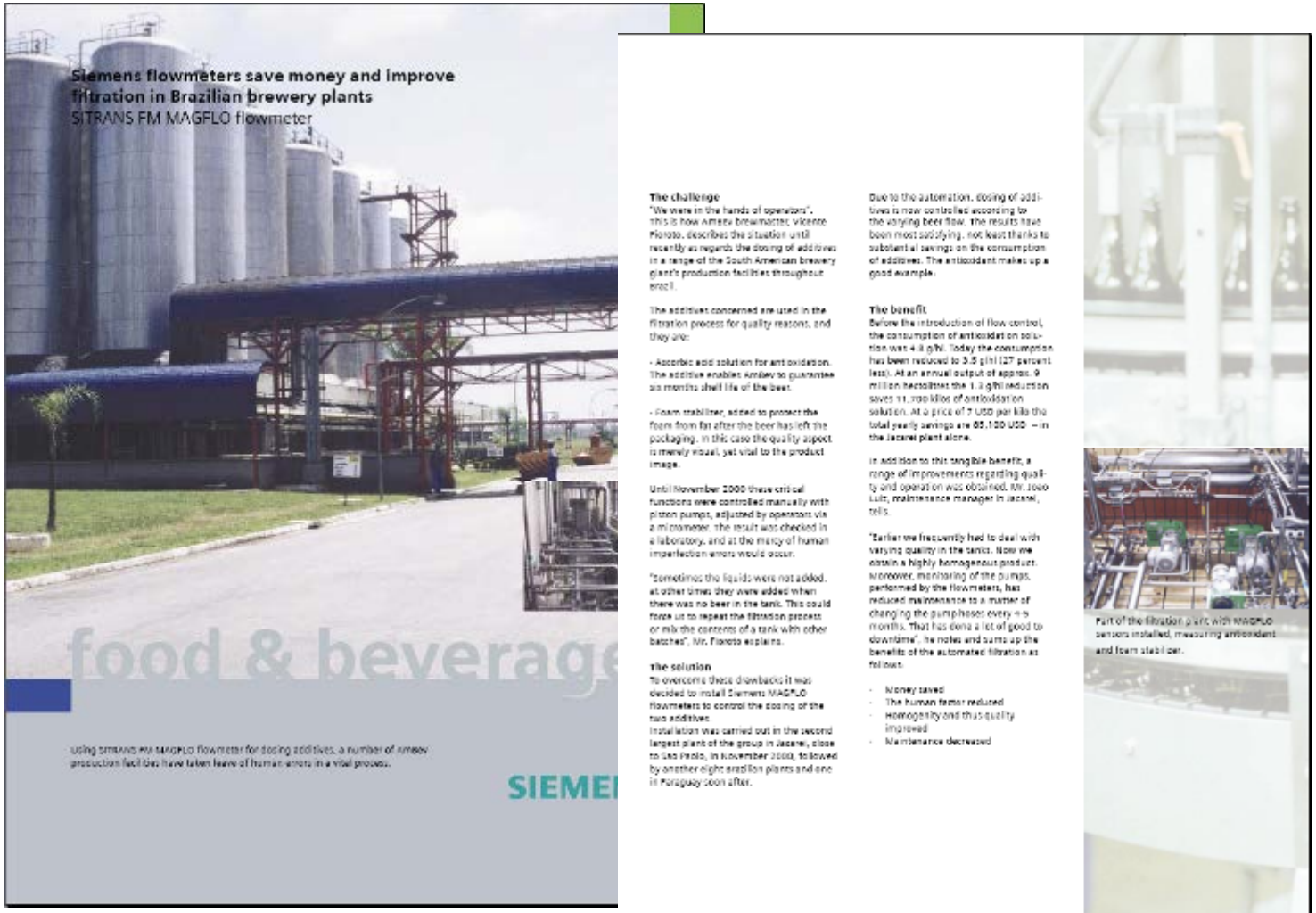
[1)] Typical accuracy and repeatability is 2 - 3 times better than stated.

Siemens Flow Instruments A/S
DK-6430 Nordborg
Denmark

Order No.
SFIDK.PA.028.N1.UK

Siemens AG
Subject to change without prior notice

Case Study Flow measurement



Siemens flowmeters save money and improve filtration in Brazilian brewery plants

SITRANS FM MAGFLO flowmeter

food & beverage

using SITRANS FM MAGFLO flowmeter for dosing additives, a number of Ambev production facilities have taken leave of human errors in a vital process.

SIEMEN

The challenge

"We were in the hands of operators", this is how Ambev brewmaster Vicente Floreto, describes the situation until recently as regards the dosing of additives in a range of the South American brewery giant's production facilities throughout Brazil.

The additives concerned are used in the filtration process for quality reasons, and they are:

- Ascorbic acid solution for anti oxidation. The additive enables Ambev to guarantee six months shelf life of the beer.

- Foam stabilizer, added to protect the foam from fall after the beer has left the packaging. In this case the quality aspect is merely visual, yet vital to the product image.

Until November 2000 these critical functions were controlled manually with piston pumps, adjusted by operators via a micrometer, the result was checked in a laboratory, and at the mercy of human imperfection errors would occur.

"Sometimes the liquids were not added, at other times they were added when there was no beer in the tank. This could force us to repeat the filtration process or mix the contents of a tank with other batches", Mr. Floreto explains.

The solution

To overcome these drawbacks it was decided to install Siemens MAGFLO flowmeters to control the dosing of the two additives.

Installation was carried out in the second largest plant of the group in Jacarei, close to Sao Paolo, in November 2000, followed by another eight brazilian plants and one in Paraguay soon after.

Due to the automation, dosing of additives is now controlled according to the varying beer flow, the results have been most satisfying, not least thanks to substantial savings on the consumption of additives. The antioxidant makes up a good example.

The benefit

Before the introduction of flow control, the consumption of antioxidation solution was 4.8 g/hl. Today the consumption has been reduced to 3.5 g/hl (27 percent less). At an annual output of approx. 9 million hectolitres the 1.3 g/hl reduction saves 11,700 kilos of antioxidation solution. At a price of 7 USD per kilo the total yearly savings are 85,100 USD – in the Jacarei plant alone.

In addition to this tangible benefit, a range of improvements regarding quality and operation was obtained. Mr. Joao Luiz, maintenance manager in Jacarei, tells:

"Earlier we frequently had to deal with varying quality in the tanks. Now we obtain a highly homogenous product. Moreover, monitoring of the pumps, performed by the flowmeters, has reduced maintenance to a matter of changing the pump hoses every 4-5 months. That has done a lot of good to downtime". He notes and sums up the benefits of the automated filtration as follows:

- Money saved
- The human factor reduced
- Homogenity and thus quality improved
- Maintenance decreased

Part of the filtration plant with MAGFLO sensors installed, measuring antioxidant and foam stabilizer.