

Process applications in a fruit juice concentrate plant:

1. Waste water alarm system
2. Phase detection at truck loading
3. Density measurement at de-acidification column

1. Waste water alarm system

If fruit juice concentrate ends up in the wastewater stream, financial loss can be considerable and multiplex:

- Loss of revenue because of lost product
- Legal fines for exceeding concentration limits in waste water
- Fines for environmental damage
- Cost of restoring waste water plant or river
- Increased annual effluent charges
- Delivery problems opens door for competition

Accidental discharge of fruit juice concentrate can occur due to human error or technical failure, and often remains unnoticed until it is too late.

If the deviation from "normal" wastewater can only be caused by fruit juice concentrate (high Brix), a simple and robust alarm system based on the Anton Paar SPRn 4115 L 2T sound velocity sensor is a perfect solution.

System description

From Anton Paar:

- Brix alarm system with SPRn / mPDS 1100 and concentration formula, alarm at >3 °Brix.



Fig. 1: mPDS 1100/SPRn 4115 L 2T

From customer:

- Installation in stainless steel box (Fig.2&3) to protect SPRn from flooding
- Welded faceplate to ensure SPR is always submerged (Fig. 2)
- Complete assembly inserted in manhole (Fig. 4)
- Complete assembly removed regularly for cleaning



Fig. 2: SPRn 4115 L 2T and welded faceplate to ensure that sensor is submerged in liquid, stainless steel box with handle for easy removal from manhole

Application Report



Fig. 3: SPRn 4115 L 2T mounted inside stainless steel box

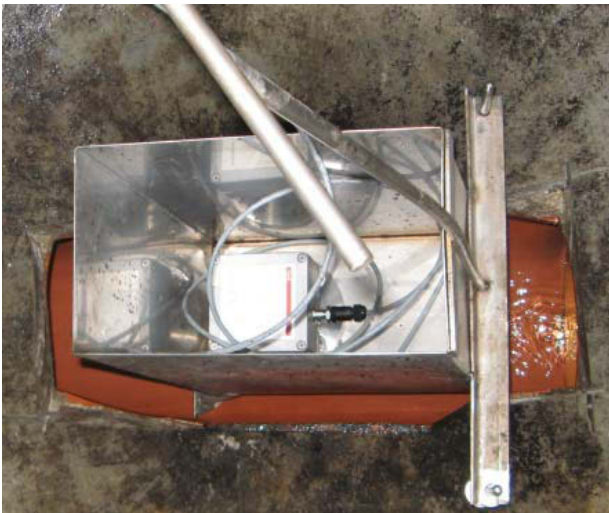


Fig. 4: View into manhole from top

Measuring principle

The propagation time of sound pulses traveling through the sample is measured together with the temperature. Propagation time and temperature information are transmitted to the mPDS system.

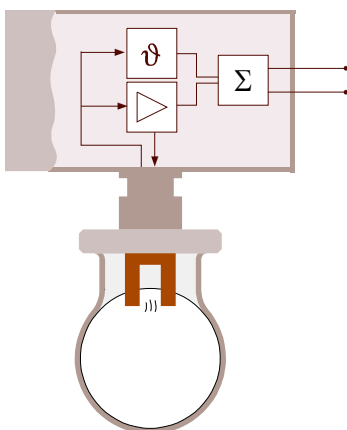


Fig. 5: SPRn sound velocity transducer principle

The sound velocity in fruit juice concentrate is drastically higher than in average wastewater. Therefore, if fruit juice concentrate is present, the sound velocity increases immediately. The sound velocity reading is converted to a Brix value in the mPDS. From practical tests onsite, the alarm limit was set to 3 °Brix, so that an alarm is activated if reading is above 3 °Brix. The alarm is sent to the switchboard, and can be relayed to on-call duty from there.

Practical experiences

The first alarm system was installed after a customer had lost several tons of very valuable raspberry juice concentrate.

Only a few weeks after the alarm system was installed, a manhole in a tank was not closed properly. Apple juice concentrate leaked into the drain. The automatic alarm system detected this immediately, an alarm was generated, and damage was limited to only a very small loss, not the complete tank.

A second system was installed in the same plant; other locations have been equipped now also.

A backwashing system to flush the SPRn and the faceplate regularly with water was installed later, as it turned out that leaves occasionally build up.

The complete assembly is removed for cleaning and checking once a week.

Configuration:

- mPDS 1100 evaluation unit
- SPRn 4115 L 2T transducer
- Concentration formula and software

2. Phase detection at truck loading

Trucks are loaded from different storage tanks, between tanks, the lines are flushed with water.

An STR 4115 A with Brix-formula is mounted between storage tank and truck, a large display informs the operator about the Brix reading. The reading is also transferred to the control system.

Application Report



Fig. 6: STR 4115 sound velocity transmitter for interface detection at truck loading

Before installation of the STR the operators had to make absolutely sure, that no water was loaded by flushing with syrup sufficiently long, syrup went unnecessarily to waste. Now the exact switching points are detected in real time, loss of syrup minimized.

Configuration:

- **STR 4115 A** transmitter
- **Concentration formula**
- **External display** (sourced locally)

3. Density measurement at de-acidification column

Some fruit syrups are run through a de-acidification column. This column needs to be regenerated with sodium hydroxide NaOH regularly. Before regeneration, the syrup is flushed out of the column by water.



Fig. 7: DPRn 4122 density transducer at regeneration of de-acidification column

The outflow of the column is checked by running it through a DPRn 4122.

The DPRn 4122 is much better suited than the previously installed inline refractometer.

Configuration:

- **DPRn 4122** density transducer
- **mPDS 1100** evaluation unit
- **Concentration formula**
- **External display**

4. Summary

A fruit juice concentrate production plant uses Anton Paar process equipment for 3 different applications:

- Waste water alarm system to detect accidental discharges into the waste water system (SPRn / mPDS 1100)
- Phase detection at truck loading from storage tank (STR with Brix formula)
- Regeneration of de-acidification column (DPRn 4122/ mPDS 1100)

In addition to direct savings, the online instrumentation also has a positive effect on operator carefulness and awareness.