POSTER SUMMARY

EVALUATION OF THE BERTHOLD TECHNOLOGIES MICROWAVE PROBE

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Abstract

The Huletts refinery (Hulref) currently uses radio frequency (RF) probes to measure the brix of the material in the white pans. Due to Hulref boiling massecuites at higher temperatures (85ºC) a number of problems were experienced with the RF probe. These included:

- The electronics failing on the probe head due to the higher temperature.
- Over time the probe measurements drifted.

Due to the reported benefits of using the microwave probe, it was decided by Hulref to evaluate this tool. The first benefit was that the probe electronics are remote to the probe head, and as a result the probe is very robust. Secondly, the probe looks at the crystal and the mother liquor when measuring the brix concentration of the sample. This benefit allows for easy probe calibration or set-up on the plant.

A Berthold Technologies microwave probe was installed on pan 2 for evaluation. The probe was set up in the working environment on the white boiling pan. Both continuous and batch pan probe installations were evaluated on pan 2 and this poster presentation summarises the work done during 2005 on the probe.

Keywords: refinery process, massecuites, boiling, microwave probe, radio frequency probe

Introduction

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A Berthold Technologies microwave probe was installed on pan 2 for evaluation. The probe was set up in the working environment on the white boiling pan. Both continuous and batch

pan probe installations were evaluated on pan 2. The earlier tests were done using a continuous pan microwave probe head, which allowed for water flushing of the probe head. This ensured that the probe did not become fowled with crystal sugar, which results in the microwave reading drifting. The temperature reading used to compensate the brix reading worked off the pan temperature probe.

Tests were also done using a batch pan probe head, which does not have the flushing facility of the continuous probe, but a PT100 temperature probe inserted. The batch pan probe does not use the pan temperature reading for compensation, but is set up to use the PT100 probe in the microwave probe head. This allows for accurate temperature readings at the point where the microwave probe is reading below the bottom tube plate of the calandria.

Probe installation

System configuration

The Micro-Polar Brix consists of the evaluation unit, the microwave sensor and a high frequency quad cable. The microwave sensor is available in two versions, as a batch pan probe without the flushing device and as a continuous pan probe with the flushing device.

The microwave sensor needs to be installed so that there is 60 mm clearance between the sensor head and any other equipment (Figure 1).

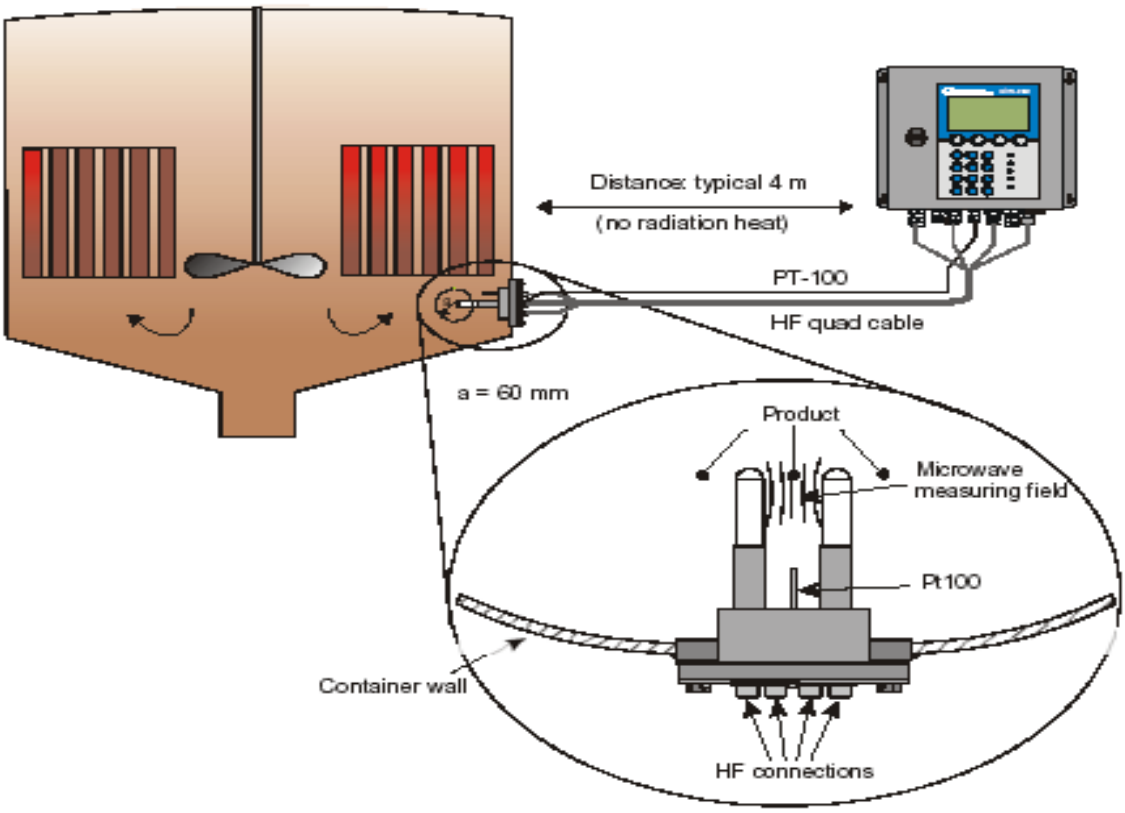

Figure 1. Typical system configuration on a vacuum pan.

Principle of measurement

Microwaves penetrate the product to be measured, causing free water molecules to rotate. This rotation causes a phase shift and an attenuation of the transmitted microwaves. Micro-polar Brix uses these two parameters to determine the concentration while influences from product type and purity of the sugar concentrate are compensated.

User interface

The operations and engineering staff communicate with the probe through the evaluation unit. The initial probe set-up, the sampling and the generating of the correlation curve are all done using the evaluation unit.

Probe Evaluation

Figure 2 shows a typical comparison of the Micro-Polar brix and the laboratory brix for a pan boil. It can be seen from the graph that the Micro-Polar and the laboratory brix correspond well. Comparisons were done weekly throughout the year in 2005 with similar results.

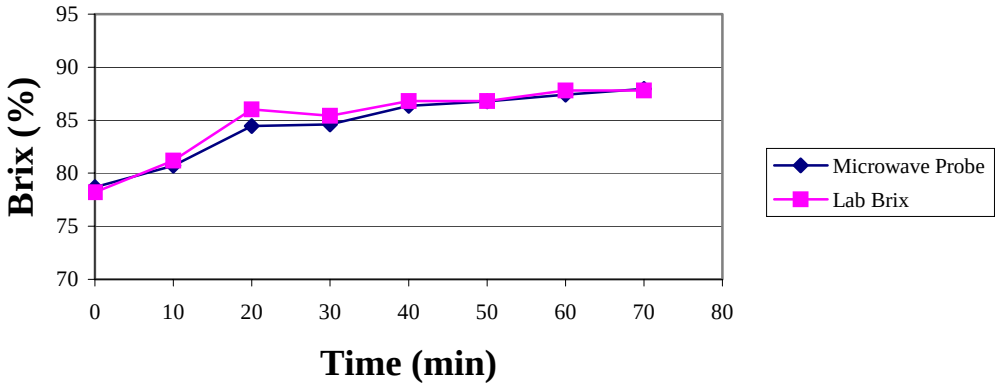

Figure 2. Typical graph of the microwave probe vs laboratory brix.

Future work

It is planned to use the microwave probe as the primary measuring device for the automation of the five white boiling pans at the Huletts Refinery. Further improvements to the control systems are also planned to happen in future years.

Conclusions

It can be seen from the evaluation data that the Micro-Polar Brix compared favourably with the laboratory figures reported. During the period of the evaluation there were also no hardware defects and the Micro-Polar Brix did not drift over time.

The probe proved to be very robust, reliable and very easy to set up. Some of the advantages of the Micro-Polar Brix when compared with the RF probe are quick installation and easy start-up. One of the biggest benefits when compared to the RF probe was the ease with which

the evaluation analyses were done. The massecuite samples did not need to be Nutsched, because the Micro-Polar Brix looks at the whole sample, not just the mother liquor.

For these reasons the Micro-Polar Brix is a cost effective alternative concentration measuring device that is easy to use and set up, even though the price is seven times that of the RF probe at R70 000.

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