

# DensiCheck TX

In-line determination of Sulphuric Acid concentration

**Industries:** Fertilisers, chemical manufacture, petroleum refining, sulphuric acid manufacture, chlorine manufacture, wastewater processing.

Data sheet : DENSI\_TX\_Sulphuric/2012

## Introduction

Sulphuric Acid is widely used as a desiccant (drying agent) in many industrial processes. In this case Sulphuric acid in the range 90..100%wt may be used but be diluted through water absorption. Permanent in-situ measurement of acid concentration measurement is essential for controlling the additions of fresh acid in order to maintain the concentration at the desired level.

The DensiCheck TX liquid concentration analyser that uses ultrasound and temperature as it's measurement technique, aids manufacturers and users in providing highly accurate measurement and thus allowing for tight process control.

## Measurement Precision

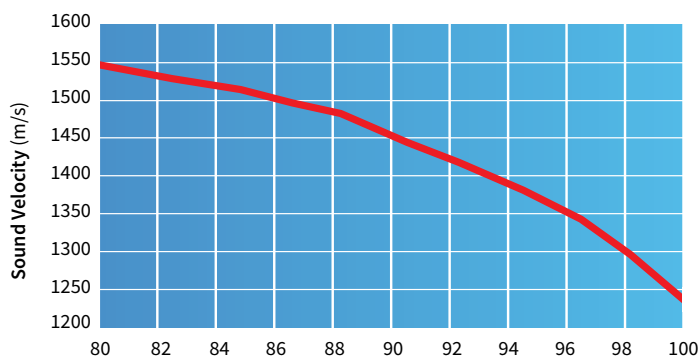
In the range 80..100%wt, the sonic velocity changes by about 300m/s. DensiCheck measures sonic velocity to within 0.1m/s, thus delivering an accuracy of +/-0.05%wt.

## Alternative Methods of concentration measurement

Typical alternative methods of measurement include conductivity probes and density analysers. The intrinsic error of any instrument

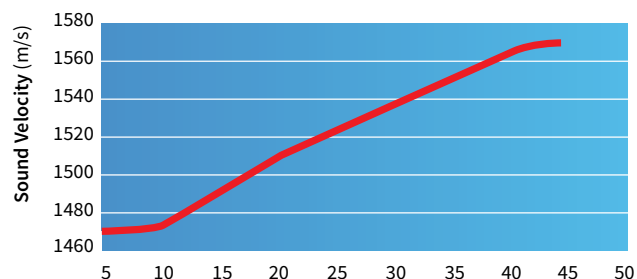


**Sulphuric Acid 80..10% wt (25 Deg C)**



used to measure concentrations is inversely proportional to the slope of the measured variable versus concentration. The density curve flattens out above 95%wt and the conductivity curve flattens below 94%wt.

**Sulphuric Acid 6..40% wt (25 Deg C)**



Consequently, the errors of analysis in densitometers and conductivity probes are large in these respective regions. In these regions, DensiCheck TX offers greatest benefit.

## Oleum Measurement

Oleum is obtained by dissolving  $\text{SO}_3$  in 100%  $\text{H}_2\text{SO}_4$ . Depending on the quantity of  $\text{SO}_3$  dissolved, concentrations can range from 100 to 130%wt. Unfortunately, the sonic velocity inverts at around 100%wt, meaning that without an external signal, it is not possible to detect between Sulphuric Acid at 99%wt and Oleum at 130%wt.

DensiCheck TX incorporates two calibration curves however, and if an external signal can be provided, the unit will flip to its second curve (in this case Oleum) and provide accurate measurement without the need for a density sensor or other external measurement device.

## Conclusion

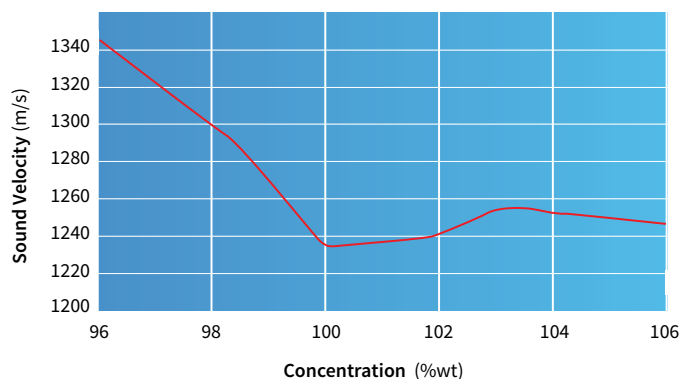
DensiCheck TX is the most accurate and cost effective instrument for the in-line measurement of Sulphuric Acid in the range 80..100%wt. Sound velocity / temperature is the only combination of measurement parameters that can be used to over the entire range of commercial concentration with accuracies at  $\pm 0.05\%$ wt. DensiCheck TX has no moving parts and requires little or no maintenance – unlike many other in-line analysers.

## Other Liquids

DensiCheck TX is being used in many different industries to measure the concentration of numerous different liquids including:

| Substance                    | Chemical Formula                 | Substance         | Chemical Formula                                 |
|------------------------------|----------------------------------|-------------------|--|
| Acetone                      | $\text{C}_3\text{H}_6\text{O}$   | Hydrogen Peroxide | $\text{H}_2\text{O}_2$                           |
| Ammonia                      | $\text{NH}_3$                    | Nitric Acid       | $\text{HNO}_3$                                   |
| Ammonium Sulphate            | $(\text{NH}_4)_2\text{SO}_4$     | Phosphoric Acid   | $\text{H}_3\text{PO}_4$                          |
| Calcium Chloride             | $\text{CaCl}_2$                  | Sodium Chloride   | $\text{NaCl}$                                    |
| Ethanol                      | $\text{C}_2\text{H}_5\text{OH}$  | Sodium Hydroxide  | $\text{NaOH}$                                    |
| Ethylene Glycol              | $\text{C}_2\text{H}_4\text{O}_2$ | Sodium Nitrate    | $\text{NaNO}_3$                                  |
| Fluorine                     | $\text{F}_2$                     | Sulphuric Acid    | $\text{H}_2\text{SO}_4$                          |
| Glycerin C3H8O3 Toluene C7H8 | $\text{C}_3\text{H}_8\text{O}_3$ | Toluene           | $\text{C}_7\text{H}_8$                           |
| Hydrochloric Acid            | $\text{HCl}$                     | Tryptophan        | $\text{C}_{11}\text{H}_{12}\text{N}_2\text{O}_2$ |

Sulphuric Acid & Oleum (at 25 Deg C)



*Excellence the World can Measure™*

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