

### ETHANOL (ETHYL ALCOHOL)

SCA-237 (4/86)

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**INSTRUMENT:** NUSONICS CONCENTRATION ANALYZER

**INDUSTRIES:** DISTILLERIES, GASOHOL PRODUCTION

**APPLICATION:** MEASUREMENT OF ETHANOL (C<sub>2</sub>H<sub>5</sub>OH) CONCENTRATION

#### INTRODUCTION

Sound velocity is an excellent tool for monitoring concentration over all but a very narrow range of ethanol concentrations in water. The following data is from *Molecular Acoustics* by W. Schaaffs, from the Landolt-Bornstein Series, Springer-Verlag Publishers, Berlin, 1967.

#### TEST CONDITIONS

Sound velocity readings were recorded at 10°C intervals from 20°C to 50°C, under atmospheric pressure. The testing was performed by R. Kuhnkies, Berlin, 1962.

#### RESULTS

Figure 1 illustrates the average potential error of concentration analysis when measured with the NUSONICS Concentration Analyzer. Figure 2 illustrates the change in sound velocity with changes in concentration. Figure 3 demonstrates the temperature coefficients, the change in sound velocity with temperature, at each concentration.

#### DISCUSSION

In the absence of interfering contaminants, the NUSONICS Concentration Analyzer can measure ethanol concentration with high accuracy over all but a very narrow range of concentrations. The specific range of concentrations with significant measurement error depends on process temperature. Please consult the Applications Group at NUSONICS for further information.

#### CONCLUSION

Because of its speed of response, high accuracy and

low maintenance, the NUSONICS Concentration Analyzer is ideally suited for monitoring ethanol concentration. With the exception of a small range of concentrations, measurement error is never greater than  $\pm 0.08\%$  C<sub>2</sub>H<sub>5</sub>OH.

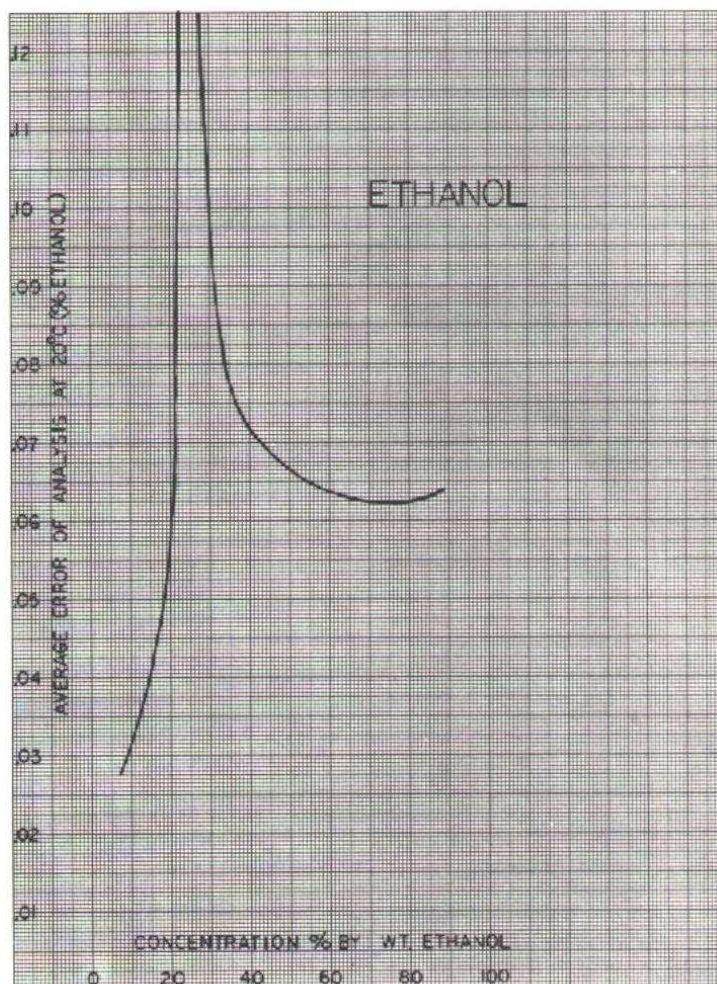


Figure 1. Average Error vs. Concentration

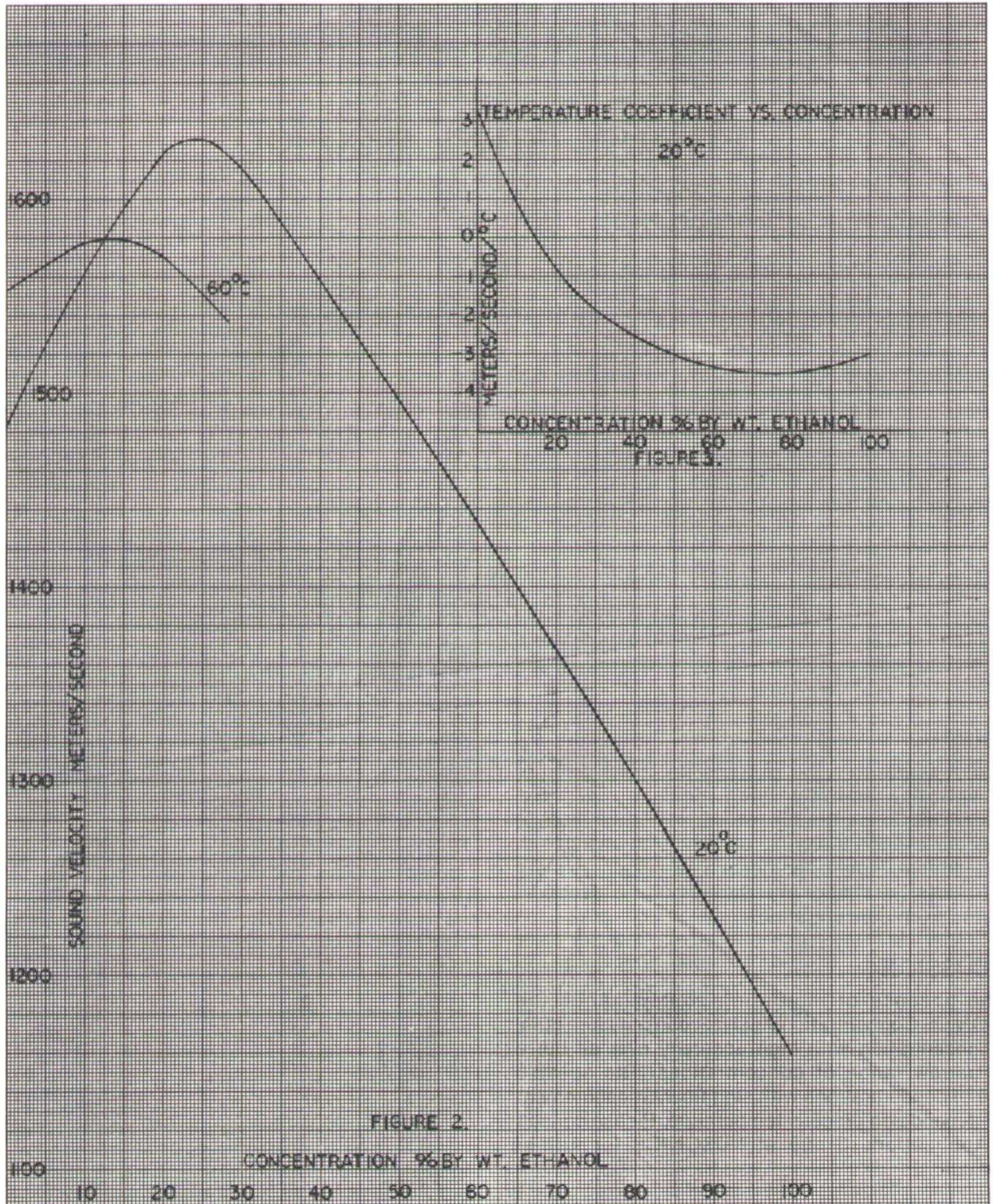


Figure 2. Sound Velocity vs. Concentration  
Figure 3. Temperature Coefficient vs. Concentration