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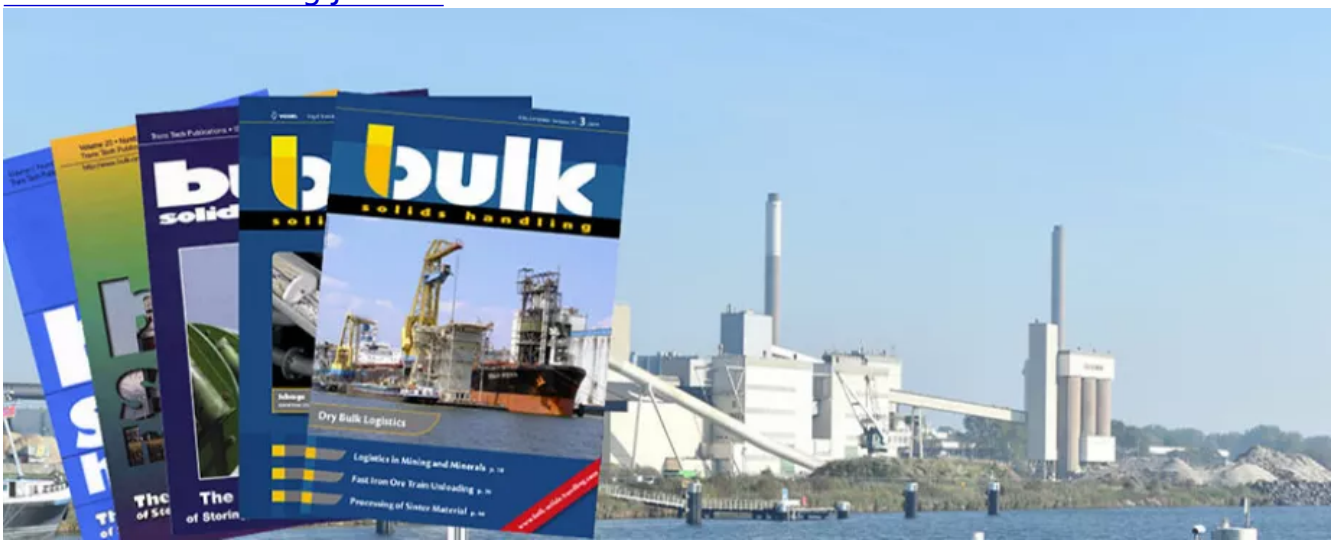

Technical Article

Solids Mass Flow Measurement in Pneumatic Pipelines by F.M. Transducer and Microcomputer

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The paper outlines the basic design of the frequency modulated capacitance transducer which has been successfully used to measure mass flow rates of materials ranging from conducting metal particles to non-conducting solids with a wide range of permittivities. The sensing electrode used offers no obstruction to the flow of the material and there are no moving parts to wear out. Parameters involved in the optimum design of the electrode are mentioned and their applications to different types of flow system shown.

Two capacitance transducers, axially spread along a pipe, sense the instantaneous concentration of the air-borne particles using turbulence flow noise techniques. The flow noise signals from the two transducers are cross-correlated to obtain the mean powder velocity. Also available from the transducer is the rectified and averaged signal which is related to concentration.

The velocity and concentration signals are then input into a PET microcomputer from which the mass flow rate is calculated and displayed. The computer also provides output signals suitable for controlling the feed rates or for triggering alarms if plant is not operating near the required set point.

1. Introduction

The chemical industry is automating and an important aspect of this introduces the need to measure quantitatively and qualitatively the state of the plant. One branch of this involves solids flow metering.

The mass flow rate of solids in a pneumatic conveyor is related to the product of the solids velocity and concentration. These two parameters are measured and a system using a microcomputer calculates the flow rate.

The microcomputer-based solids flow meter is simple, reliable and low in cost. It is intended for flow indication and alarm in automatic plant and machines handling solids materials. It is suitable for flow measurement and control in the majority of process situations where accuracies of a low percentage, together with continuous flow measurement, are required.

A block diagram of the system is shown in Fig. 1. It consists of two capacitance transducers, a cross-correlator, an interface unit and a microcomputer.