CONTROLS WAYS OF THE TRANSPORTATION CAPACITY VARIATION FOR THE CANVAS CONVEYER

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Abstract: Mining transportation is an important element of the economic efficiency rising in mining sector, because the transportation average included in the cost of production for one tone of extracted coal, represents approximately half of it. In order to control the transportation system and to have enough information about the below-ground and the above-ground manufacturing process, it is necessary to keep a close look on the transported output through the canvas conveyor. The present study wants to solve the problem by using some unconventional methods, in order to assure reliability, precision, as well as the possibility of integrating it into the mining monitoring system. The constant measurement of the cross section of the transported material through the canvas conveyor, as well as of the belt speed, leads to the determination of the transported volume, and depending on it, knowing the average density, you can determine the output.

Keywords: canvas conveyer, mining monitoring system

1. THE ULTRASOUND TRANSDUCER MICROSONAR UT-212

In order to measure the height of the profile of the transported material, at the head of the canvas conveyor, it is used ultrasound transducers. Microsonar UT-212 (figure 1) is a ultrasound transducer suitable for detection of the position or measuring distance of objects. The measurement can only be accomplished if the space between the unit and the target is free of any obstacles for making the way of the ultrasound

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beam and good reflection on the target.

![Ultrasound transducer Microsonar UT-212](image1.jpg)

**Fig. 1.** Ultrasound transducer Microsonar UT-212

In order to avoid such interference (figure 2) between two or more units of this type, depending on the installation, the units should be installed at a minimum distance of $B_{\text{min}}>0.25$ m. Consequently the number of disturbing points will be limited. This allows the transducers to determine the profile of the transported material.

![Interference depending on the installation](image2.jpg)

**Fig. 2.** Interference depending on the installation

The transfer characteristic of the Microsonar UT-212 transducer is shown in figure 3.
According to the targets position (figure 4) the result of the measure will be the one shown in table 1. The experiments were made using two transducers Microsonar UT-212, which were installed on a plate surface (figure 4), which allows to change the distance in order to set up their transfer characteristic.

In figure 5 it is shown the transducer transfer characteristic MicrosonarUT-212, as well as its transfer equation.

2. PROGRAMMING

Analogue-digital conversion:
1) select the channel to be read
   OUT port, channel

<table>
<thead>
<tr>
<th>Targets present</th>
<th>Measured distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2, 3</td>
<td>X₁</td>
</tr>
<tr>
<td>2, 3</td>
<td>X₂</td>
</tr>
<tr>
<td>3</td>
<td>Error</td>
</tr>
</tbody>
</table>
2) cancel the parameters
   \[ \text{OUT (port+1),1} \]
3) start conversion
   \[ \text{FOR I=1 to 6} \]
   \[ \text{A=INP (port+12)} \]
   \[ \text{NEXT I} \]
   \[ \text{FOR I=1 to 8} \]
   \[ \text{A=INP (port+8)} \]
   \[ \text{NEXT I} \]
4) read the above octet (4 bits)
   \[ \text{C=INP (port+3)} \]
   \[ \text{HB=}(C/16 - \text{INT}(C/16))*16 \]
5) read the below octet (8 bits)
   \[ \text{LB=INP(port+2)} \]
6) measure the value
   \[ \text{A/D=}HB*256+LB \]
Analogue-digital conversion:
1) write the above octet on the channel 1 (4 bits)
   \[ \text{OUT (port + 5), Hdata} \]
   \[ 2) \text{ write the below octet on channel 1 (8bits)} \]
   \[ \text{OUT(port+4),Ldata} \]
3) write the above octet on channel 2 (4 bits)
   \[ \text{OUT (port + 7), Hdata} \]
4) write the below octet on channel 2 (8 bits)
   \[ \text{OUT(port+6),Ldata} \]
The programming has the following functions:
- reads the frequencies of the transducers, at different intervals chosen by the user;
- displays analogically the value of the read frequency, and digitally its value and the value according to its distance (figure 6);
- at the user request writes in a folder the value of the read distances;
- by pressing a button allows to drive a pitch by pitch motor in order to measure a specific target;

Fig. 6. Display capture

As shown in figure 4, only two transducers were installed on the plate surface, the other two being simulated by two potentiometers. The target to be measured driven with a pitch by pitch motor is shown in figure 7. The profile obtained after running the programming is shown in figure 8.

Fig. 7. The target to be measured

3. CONCLUSIONS

To measure the volume of the transported material means to approximate its profile by interpolation and measuring its momentary velocity. The researches done conclude that it is possible to measure with a transducer the profile height of the transported material at the head of the canvas conveyer.

The effective measurement of the volume is done by taking information from the transducers to a computer and a data acquisition card. Taking into account the
speed variation of the measured materials (the profile variation and the speed variation) we can say that the programming in C language can give us instantaneous information regarding both the volume of the transported material and its discharge.

BIBLIOGRAPHY

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