Measurement of mean shape coefficient

A particle is transported by air. According to the principles of aerodynamics the position of a particle is firmly stabilized in relation to the airflow. An irregular flat particle moves along a line according to its smallest dimension, which is the width of the pulse determining the particle dimension.
For a frequency of 12 MHz a direct measurement of the pulse width may be conducted while measuring the amplitude, which allows to determine the shape coefficient.

WK = Amplitude/pulse width.

The pulse width unambiguously determines the smallest particle dimension i.e. its thickness.
The velocity of particle movement in the measurement space must be firmly determined for such measurements. This velocity depends on flow characteristics of the compressor, which must be precisely calculated by constant measurement of air output. Thus, the particle width is not dependent on its movement velocity by considering the ratio of instantaneous velocity during the measurement to the maximum velocity during which the measurement system calibrates.
The actual particle width S_{rz} depends on the measured width S_{pom} and the airflow coefficient Wpp

Srz = Spom * Wpp

The change of Wpp coefficient is approximated by a linear function presented in Figure 14 and is dependent on the Uc value, which is the measured air output of the air flowing through the measurement system using a flume.
The particles in feeder tubes are subjected to accelerations from zero velocity to measurement velocity which for identical particles depends on the specific weight of a particle. This relationship may be derived from the condition of balance between inertia forces and aerodynamic forces in order to consider the specific weight.

$$Sg = S_{rz} \cdot \sqrt{\frac{\gamma_{wzorca}}{\gamma_{rzeczywiste}}}$$

Moving particles in the horizontal axis parallel to the measurement may rotate around the vertical axis. This leads to a decrease in the mean shape coefficient, To avoid this, we correct the shape analysis by means of sieve calibration. With access to sieve calibration according to „Elsieve” method (Polish patent No. 205738) it is possible to correct statistical particle elongation by the ratio of the maximum dimension for spherical calibration to the maximum dimension for sieve calibration.

$$Width = S_g \frac{DM_{sit}}{DM_{sfer}}$$

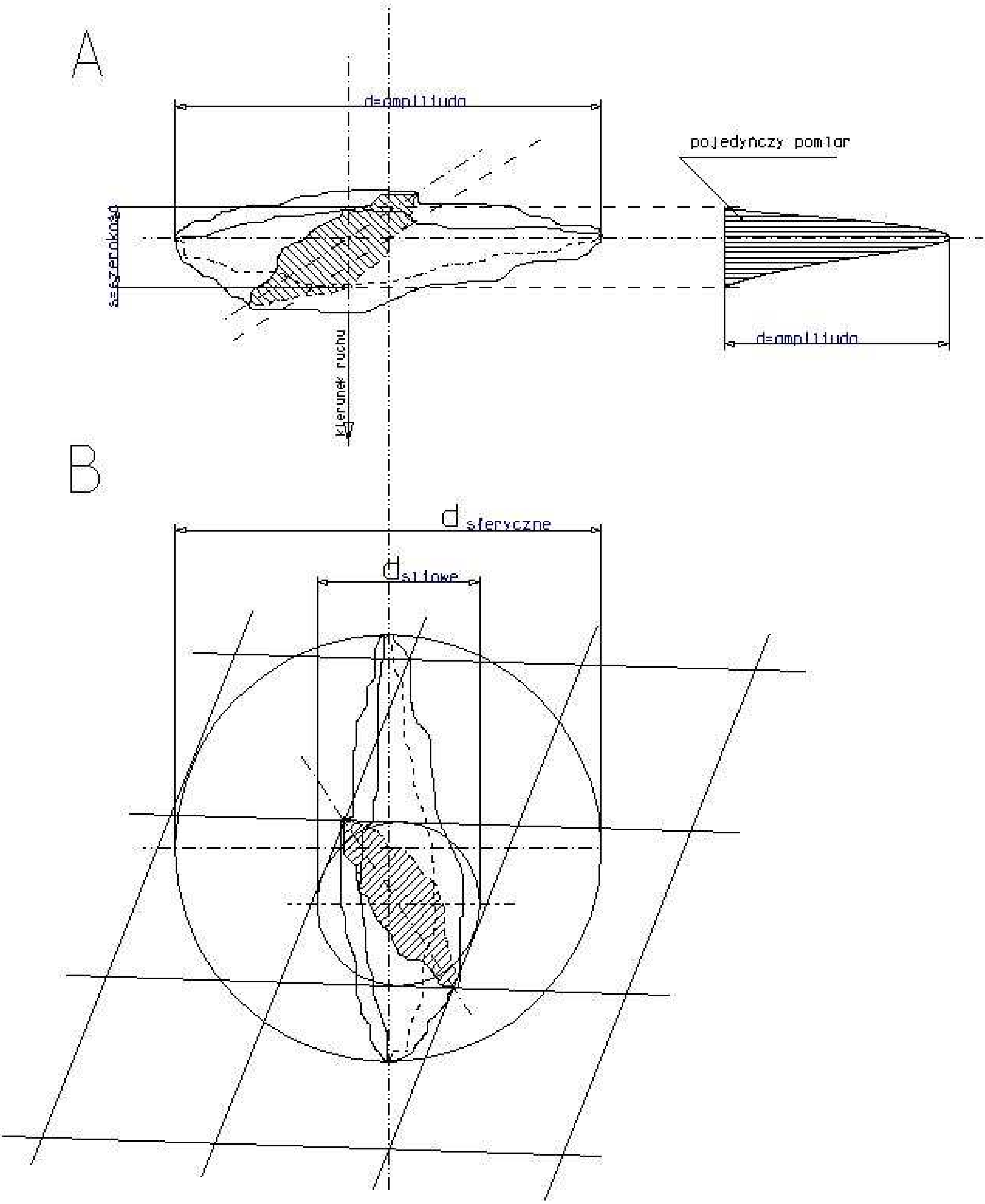

Fig. 13 Comparison of measurement methods

A. Optoelectronic measurement
B. Sieve measurement.

Relationship between the Wpp coefficient and particle velocity, proportional to UC value is presented in Fig. 14. The visualisation and UC result is found as a green bar and a number to the left of the measurement chart. The parameters of the equation are found in the service/service tab as P0 = 0.2372 and P1 = -0.7425. Coefficient Wpp = f(Uc) for the automatic feeder is presented in Fig. 14.

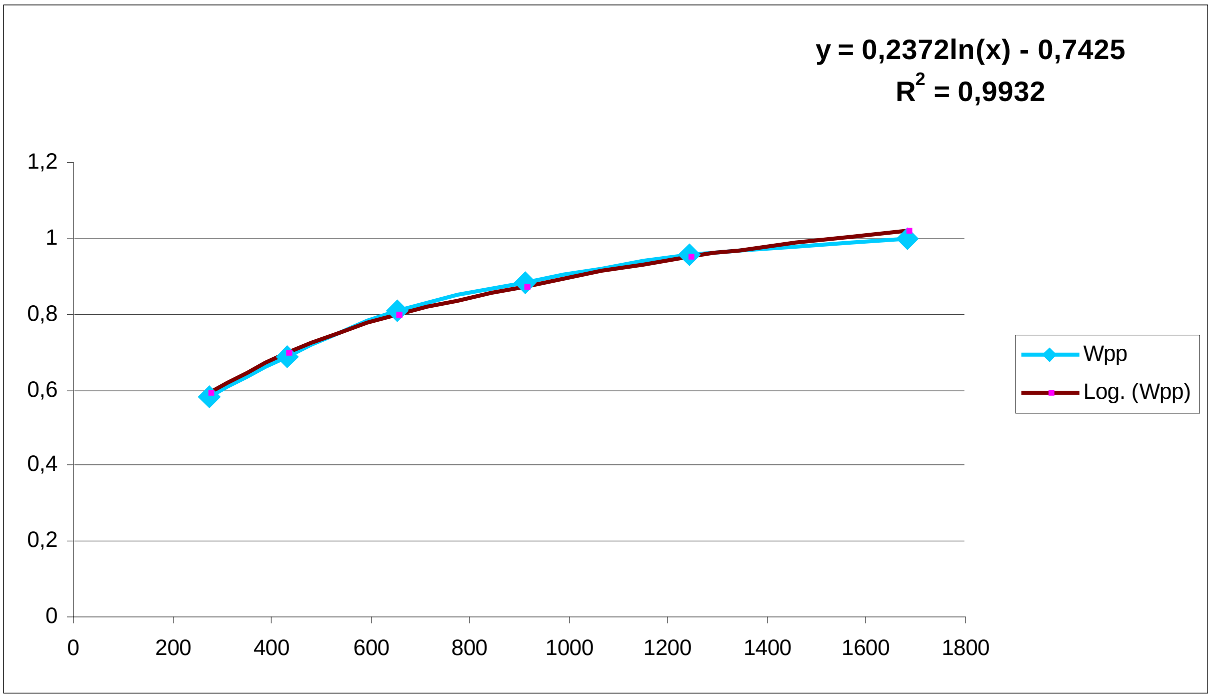

Fig. 14 Wpp coefficient Vs. Uc value