



## APPLICATION NOTE: AN-008

### Particle Shape Analysis of Coal Powder

This article describes how the [Pi Sentinel PRO](#) can be used to analyze a coal sample by looking at all the different shape measures. It can be used to obtain many histograms of factors like **Size**, **Circularity** and **Smoothness**. The software has a diagnostic tool that has these shape test images.



#### Using Pi Sentinel PRO to analyze Coal samples

Anyone of the shape measures can be examined, for example equivalent circular aerodynamicity which assumes particles are spherical. However, coal samples are very irregular, and so assuming the particles round is not a good assumption.

There are **Circularity** measures which are independent of size. Then there are other values, for example **Smoothness**. The first thing to do is look at the thumbnail images, which give a visual idea of all the particles allowing easy identification of irregular particles. We can clearly look at specific portions of the distribution based on the different shapes of the particles.

A selection of particles that have a specific quality can be identified, for example particles that are very irregular. If particles that have a circularity greater than 0.7 are wanted, only the particles with a circularity greater than 0.7 will be shown, except for in some cases some calibration beads or out of focus particles, although these can be eliminated and corrected for.

For more details click on below link:

<https://www.youtube.com/watch?v=RcxI8Q2sYOc>



## **Advantages of Pi Sentinel PRO**

Another helpful feature of the Pi Sentinel PRO is percentiles area, which enables quality control. The customer can apply quality control measures, and in doing so determine what would pass and what would fail. The thumbnails show all images under these parameters.

The correlation plot is another [Pi Sentinel PRO](#) feature, which allows you to compare any two measures against each other. For example, take a comparison of size and smoothness.

In the analyzed coal sample, there were two size populations, a smaller, more irregular population, and a larger population. The larger particles were smoother than the smaller particles, which is interesting, because normally particles get smoother as they get smaller. This could mean that there is a milling process.

Particle classification is something that allows Pi Sentinel PRO users to set ranges to look at specific populations in the sample. For example, to separate by size to find the small and the large particles, the smaller particles could be set as less than 10, and the large as 10 to 500.

Other measures could be applied here. For example, a classification based on smoothness as well as whether they are small or large. The statistics of each characteristic group can then be analyzed, and the shape measures represented by this group can be looked at.

Another feature Pi Sentinel PRO provides is the ability to do multiple run summaries. For example, two different samples can be run before creating an overlay. Overlays are very useful, and can be applied by factors like size, mean size, and number.

## **Conclusion**

In conclusion, when using the [Pi Sentinel PRO](#), looking at the thumbnails gives you a qualitative measurement, and further correlation plots, classification, overlays and Excel exports give more quantitative information.

## **End of NOTE**

