

Technical Data Sheet 118

Pig Run Analysis vs. Single Point Analyses



The following study was performed by MIC Corrosion Tek to determine the results of different sampling methods and their data from Black Powder samples, to see if they would correlate. The study was performed comparing Black Powder data from an average of 5-each "Static Sampling Points" and Black Powder collected from a pig run performed on the same section of pipeline. The static sampling points were positioned within approximate same divisions of length of the pipeline. The pig run was collected at the receiver of the total length of the pipeline section tested. The pig used was of a wire-brush pig design.

In a quick summation, the data illustrates that the data collected from the "Static Sampling Points" and their average is significantly different from the data collected from the pig run. This draws one to the conclusion that single sampling point's data does not represent sampling of pig runs and visa-versa. Raising the question if either of the sampling methods data are representative of the actual Black Powder properties within the pipeline. The study presented here is a good representation of information from other MIC Corrosion Tek studies.

In the past, information gathered on Black Powder in pipelines and their source was largely determined by using single point sampling and final pig run product. This study, and in other studies like it, indicate the data collected by this practice may be skewed and therefore so may be the conclusions and actions for mitigation and identification of source.

MIC Corrosion Tek came to the conclusion that another sampling method must be designed to collect relevant in-situ data on Black Powder, within a particular pipeline, to accurately determine the source and actions for mitigation as well as expand the knowledge of Black Powder in general for the pipeline industry.

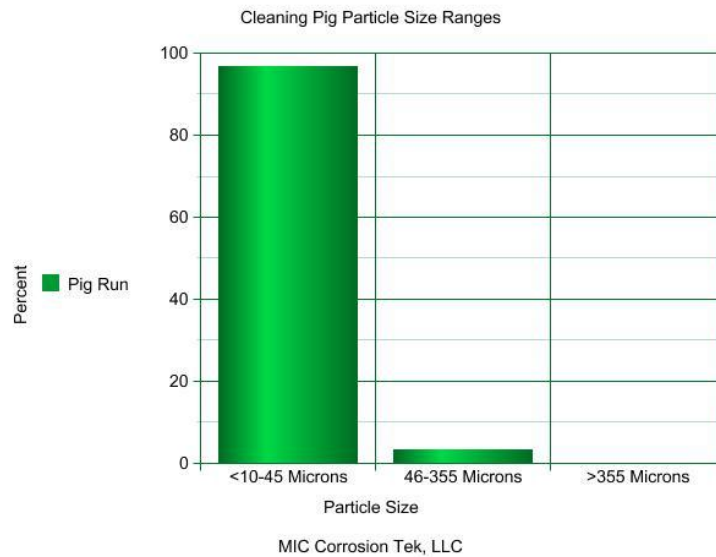
MIC Corrosion Tek relied on it's over 25-years of experience of analysis of internal pipeline corrosion and developed the MIC-Pig to perform the duties of collecting an in-situ representative sampling device for pipelines. The MIC-Pig is patent pending and the only device which performs such a task.

The data presented in this study illustrates the high deviation of data collected by present sampling methods and conclusions will follow.

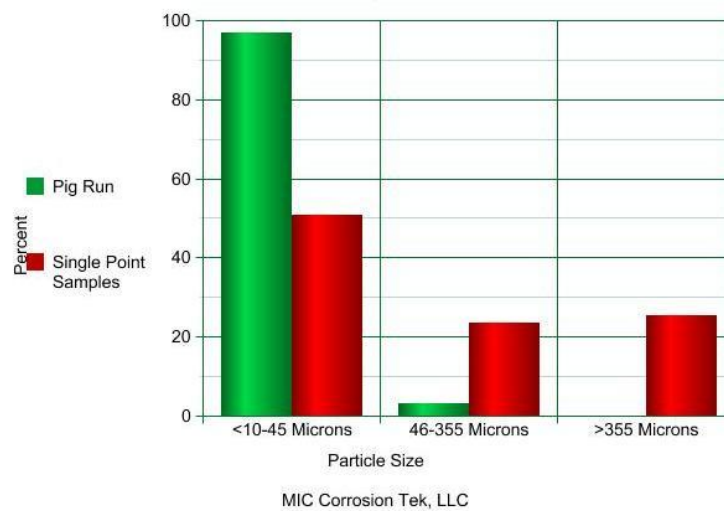
Particle Size Analysis:

Particle size of collected Black Powder is essential in determining various constituents, properties and possible source of the Black Powder. The Black Powder's constitution identifies the molecules present and provides insight as to how the molecules were formed. Properties of the Black Powder's particle size are a valuable piece of the puzzle.

Below, is a graph showing the results of the particle size ranges of the Black Powder collected at the end of the pig run. The results are listed as a percent of the total:



Notice that the majority particle size is within the <10-45 Micron range. These are very small particles. Now, let us look at how this data compares to the data of the average of the 5-single point samples:



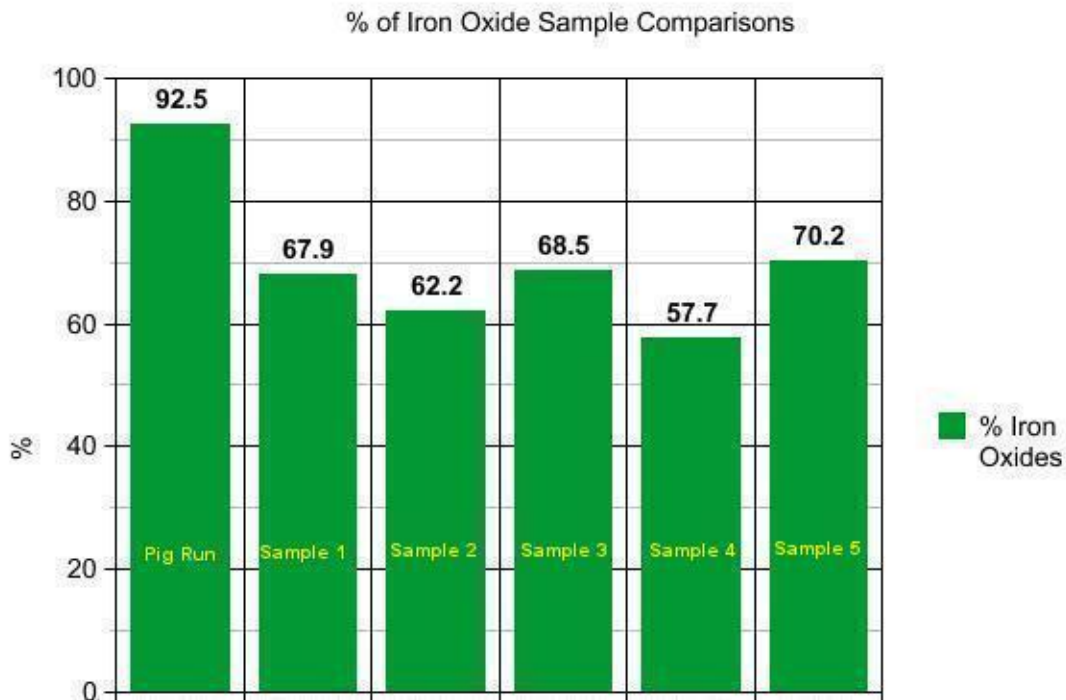
It is quite obvious that no correlation exist. The average single point particle size contains only about 50% of the <10-45 micron size range of the pig run sample. The remaining particle size range is larger; >45 microns.

Why is this occurring? It appears that the pig run was not able to successfully remove larger particles. While this information is somewhat accepted in the industry, companies still use pig run samples for information on the Black Powder. Upon the analysis of Black Powder collected by pig runs, no consideration is usually taken for the lack of efficient cleaning by the pig.

The single point samples deviate and show no correlation either. The data supports this in particle size analysis of each single point sample in this study. Therefore, using single point sampling methods may skew the properties of Black Powder particle size and result in possibly skewed conclusions in general. This derived information may result in misinformation of how the Black Powder was formed, for that specific pipeline; possibly resulting in misguided mitigation programs and solutions to abate the Black Powder problem.

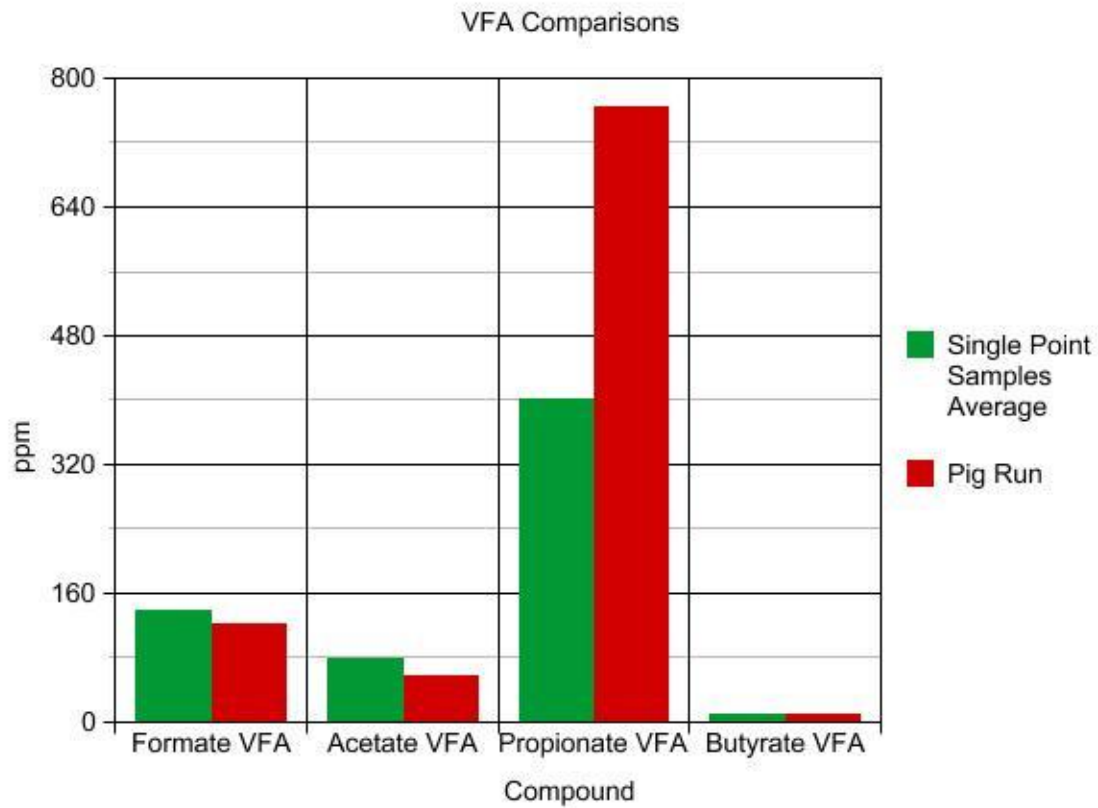
Other analytical components of this study illustrate the same scattered data points:

% Iron Oxides:



Iron Oxide percentage is a very important component in determining molecular composition, crystal structure and stoichiometry. Notice how the standard of deviation is large within the results.

Volatile Fatty Acids:



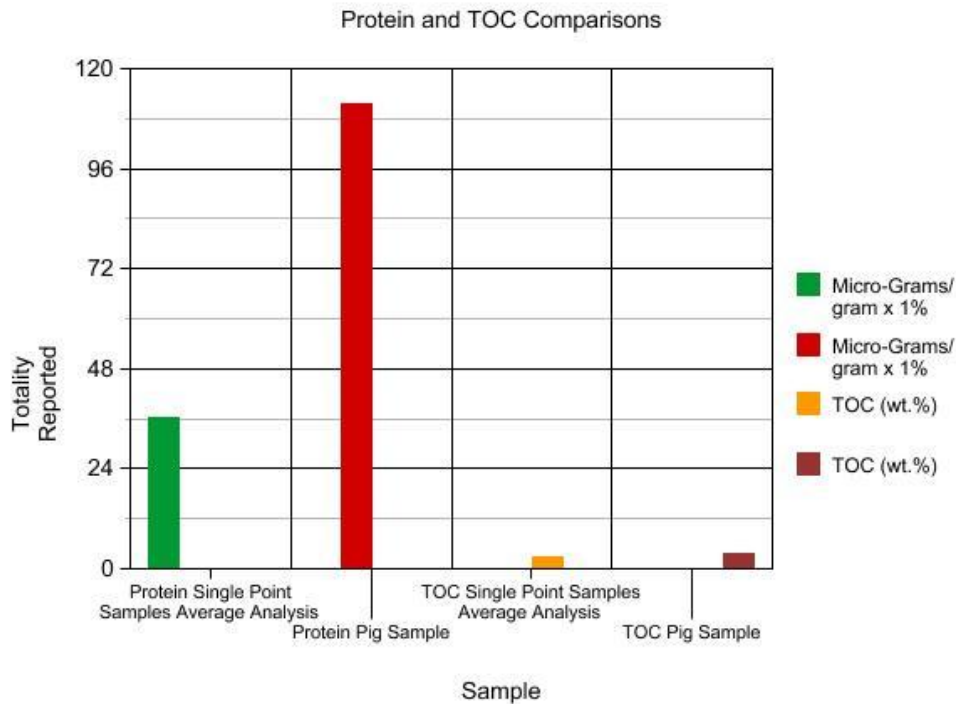
MIC Corrosion Tek, LLC

Volatile Fatty Acids are important in determining the possible quantity of Acid Producing Bacteria (APB) available to participate in MIC corrosion. They are the by-products of APB metabolism. The larger the population of APB; the greater the ppm of VFA. Notice the deviation of ppm in the pig run sample and the average ppm in the single point samples of the various VFA.

VFA quantity and quality is also important for the growth rate of sulfate reducing bacteria (SRB), as VFA are a nutrient for SRB.

VFA analysis is of major importance when determining the presence of MIC bacteria and its possible aggressiveness in the corrosion process.

Protein and TOC:



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Protein and TOC quantities are an important factor in determining the availability of nutrients for MIC bacteria. Their quantities help determine what the optimum growth rate, population size and corrosion aggressiveness these bacteria can implement.

The great difference in quantity of protein between pig run sample and single point sample average, illustrates how wrong assumptions may be made according to sampling methods.

Conclusions:

The data presented illustrates how sampling methods of pipelines are an important variable in determining the accuracy of the analysis of Black Powder. It is obvious that single point samples vs. pig run samples have no correlation in the data derived. Other elemental and properties testing show great statistical deviations also. The testing reported in this study is a small sample of how data differs from pig run samples vs. single point samples.

The accuracy of the data derived is imperative in determining abatement programs for the formation process and remediation of the Black Powder problem. In-situ sample collection in pipelines is the only method which may result in accurate data being collected.