Screen Cloth Naming Conventions

by Mark Morgan

The information used to describe or designate a specific screen is usually limited to the mesh number. During the 1970's, the predominant mesh type utilized in the oilfield was market grade square mesh screen cloth. The mesh numbers that referred to this popular cloth were derived from the U.S. test sieve series, the A.S.T.M. industry standard for accurate screen measurement. Originally, when referring to a 50 mesh screen it was assumed that the screen had 50 openings per linear inch in each direction while using a wire diameter of .215mm for both the warp and shute wires. A screen having these dimensions would consequently have an opening size of 280 microns in each direction. It is apparent that if the number of openings per linear inch is held constant and the wire diameter is changed, the opening size and the subsequent cut point of the screen will be changed as well. This is important because the accuracy of the cut point made by the screen panel is thus directly related to the standard U.S. test sieve series. Accurate measurements from a recognized standard are crucial because an inaccurate or inefficient cut can prove detrimental to the screening process, as well as prevent comparative analyses of screen types. The organization that establishes standards for oilfield screens is the American Petroleum Institute. The latest version of the Recommended Practice for Shale Shaker Screen Cloth Designation (API RP 13-E) was published on May 1, 1993.

The oilfield drilling industry's demand for higher flow rates and finer screening led to experimentation with rectangular openings and screens having finer wire diameters, such as tensile bolting cloth. Oilfield screens continued to be referred to by the manufacturer's labels, which indicated only the mesh count. However, mesh count was no longer an accurate indicator of the opening size or the resulting cut point of screens made from finer diameter wires. In an attempt to mislead consumers, some screen manufacturers started using the sum of the mesh count in each direction as their mesh count label for marketing purposes. That is, a rectangular mesh screen with 40 openings by 60 openings was now being called a 100 mesh screen. The average micron opening size for such a screen is 270 microns, only 9 microns finer than the aforementioned ASTM U.S. Test Sieve 50 X 50 (279microns) market grade square mesh screen.

The oilfield as a whole became confused by this apparent change in mesh size labeling. To rectify this deceptive marketing ploy, API published the Recommended Practice 13-E for Shale Shaker Screen Cloth Designation in 1985. RP 13-E, as it became known, required screen manufacturers to include on the screen box label the following information:

- The mesh count in each direction
- The opening size in microns for each direction
- The percent of open area

In 1977, Derrick® Corporation revolutionized screening technology with the introduction of the layered screen. Previous mesh sizes consisted of simple square weaves that were arranged in single layers. The finest particle cut that could be made was 60 mesh U.S. and the most widely used cloth was only a 38 mesh. It was common knowledge that two factors were responsible for limiting the use of finer screens. First, blinding occurred when processing sand and fine round particles whose size was near that of the mesh openings. The second problem occurred when conveying oversized particles, which had a tendency to conglomerate or mass together, resulting in directionless movement across the shale shaker.

Derrick Corporation used the layered screen cloth in the production of the Sandwich screen panel. This new panel type was constructed from finer wire screen cloths which were woven to exacting standards never before adhered to. Sandwich screen cloths were then placed above a slightly coarser mesh screen cloth which created a layered screen assembly. This combination resulted in a series of screen panels which demonstrated the unique ability to resist near size particle blinding while making extremely accurate cuts. Cut points determined by particle size distribution can be affected by the size range of the solids tested and percent of the total solids in each size range. Since these cuts are to some degree dependent on the type of

feed to the screen, extensive testing is required to insure that the anticipated cut point is in fact the actual cut point.

In 1988, Derrick Corporation developed a screen series known as the HP. The principal design criteria entailed utilizing heavier wires and slotted openings in an attempt to impede wear on the screen, which results from the abrasion caused by the particles being screened. The result was a screen that effectively extended "cloth life" while retaining the positive non-blinding characteristics produced by the DX cloths.

It is necessary to note that several of the factors responsible for screen cloth failure have little to do with the stamina of the fine screen cloth. These factors include:

- Tensioning of the screen cloth during manufacturing
- Condition of the support bed on the vibrating deck
- Tensioning of the screen during installation
- Abrasiveness of the feed material
- The manner in which the feed is presented to the screen
- Shipping, storage and handling of the screen panels

Derrick developed the HP series and first introduced it on the patented PWP repairable flat screen design. The U.S. market was slow to embrace the HP series over the popular DX series cloths. Reasons for this hesitation include reluctance to substitute part numbers on the part of purchasing departments, overall satisfaction with the DX product, familiarization with DX results, and desire to keep inventories simple. A less significant factor revolved around discussion in the technical community that the new slotted HP series would not make an accurate cut because sliver shaped particles would be allowed to pass through the slots.

This led to several attempts to predict the cut point of various cloth configurations, including computer aided optical cut point determination and other mathematical algorithms. The development of laser light defraction instruments and standard wet sieving practices also ensued.

Ultimately, the most widely accepted result consisted of hundreds of individual wet sieve tests of different samples which produced repeatable and verifiable results to anyone patient enough to conduct the testing in a scientific manner. Numerous laboratories, all with differing concerns, verified the results of these extensive tests. It was unanimously decided that in every case, the Derrick HP screens cut as advertised.

The screen cloth market is presently polarized; the domestic market prefers the DX series while the foreign market uses the HP series almost exclusively. The most likely reason for this preferential division of cloth types is that the overseas markets were offered both the HP and the DX cloths at the same time. This means that there were no preconceptions about either cloth thus there would be no basis for comparison between the two.

In many ways the cloths are much the same. The costs of the two cloths are similar and the cut point choices are almost identical. There is full availability for each. Both series are constructed from 316 stainless steel and are manufactured to the same degree of Derrick high quality standards.

Derrick offers the HP screen cloth in a traditional flat repairable PWP style and in the revolutionary PMD & PMD+ Pyramid screen design. The Pyramid screen consists of a corrugated screen, which results in finer cuts, higher fluid throughput, and drier cuttings. Maximizing the solids removal capabilities for all shale shakers, the Pyramid screen provides a margin of safety for the solids control system.

Recently, some manufacturers have begun to re-introduce their own versions of slotted cloths under new names and with arguable claims concerning screen life improvement and cut point accuracy. Unfortunately, this is a return to outdated technology at the cost of screening performance. Many of these manufacturers

do not wish their actual cut points to be exposed thus they refuse to comply with API RP 13-E standards. These companies often substitute non-scientific field data in place of recognized source fact.

We at Derrick accept and encourage new efforts aimed at improving the art of screen cloth design. We are, however, concerned that misleading test results and the deceptive marketing of screens can have costly ramifications to the consumer. We do not wish to see the drilling industry lead into a new era of confusion concerning how to properly and efficiently maintain a solids control system.

The most assured way of creating a problem in the solids control industry is to mislabel screens. Regardless of the source of this confusing and misleading information, the resulting damage to the industry is the same. The API recognized this problem and the significant danger of misrepresentation, either intentional or otherwise, and proposed a solution. In 1993, a new API RP-13E report was published outlining an improved standard procedure for labeling of shale shaker screen cloths. This outline provides a method for the direct comparison of screen cloths, independent of the type of machine on which they are installed or the type of screen configuration (i.e. square weave, oblong weave, layered or panel design). This API RP is organized in such a way that the screen label, its position, and the information required to be included on the label is all described first. The procedures used to obtain the information for the label are then described and example calculations are provided. The third edition, published in 1993, requires the manufacturer to affix a tag directly to the screen in such a position that it will be both visible and legible after the screen is installed on the shaker. The components of the designation system provide a complete description of the screen's identification and performance parameters. The designation system consists of the following elements:

- The manufacturer's designation
- Separation potential (cut points for d-50 / d-16 / d-84)
- The flow capacity (measured in kd/mm)
- The total non-blanked area available for screening (measured in square feet)

This standard is still in effect and Derrick Corporation strongly encourages consumers to be familiar with it. The American Petroleum Institute in Washington, DC will gladly provide a copy of the standard upon request.

One should not make assumptions regarding the accuracy of cut points. Screen cloth cut points are difficult to determine, even for the most sophisticated operators with years of experience.

Screen cloth design and the multiple combinations therein are all engineered to create accurate, repeatable cuts. The intricacies of screen cloth design are also extremely complicated to determine. The suggestion by some manufacturers that one can simply change mesh counts, wire diameters, and slot lengths while still achieving the same cut point as screens that are specifically designed are completely untrue. The consumer must be aware of the appearance of these products and should expect each manufacturer to conform to API RP-13E standards, which are in place to provide honest and verifiable test results regarding the cut points as they are advertised. Side by side field tests for particle size will NOT provide valid data when comparing dissimilar screens.

In the end, the ultimate determination of screen cloth construction still relies on massive amounts of test data which must be compiled by experienced and unbiased technicians. Derrick Corporation continues to innovate and improve screen panel technology for the oilfield. Derrick pledges to continue marking our products with accurate cut points derived from recognized test practices while conforming to API RP-13E standards. We encourage other manufacturers to do the same.