Variables vs Attribute inspection:

In simple terms attributes control is at the limits, variables control within the limits. Concerning the data that is generated by each concept, attributes data is discreet whereas variables data is continuous. It is established fact that attributes control has been on a gradual but pronounced decline in American Industry since the mid to late fifties. Some of the reasons for this trend are as follows:

A. Manufacturing and quality are no longer divorced functions in most industries - indeed they shouldn't be. Inspection for the sole purpose of outright acceptance or rejection denies the essential economic advantages inherent in a modern, well—defined quality program. It is axiomatic that passing judgment on a lot or batch of material that has already been manufactured without proper in-process control is weak and ineffective quality assurance.

While a well-defined quality program requires certain commitments on the part of management, invariably the subject of proper gaging emerges -whatever the commitment might be.

One area that comes under close scrutiny is attributes inspection. Almost without exception it is found that attributes inspection is counter-productive. When proper comparisons to variables inspection are evaluated, the following undeniable facts emerge.

1. Variables inspection offers complete control over the manufacturing process. With variables data trends are seen allowing for corrective action to be taken long before the product reaches the reject level.
2. Variables data allows for the orderly and precise control over process adjustments. Changes in the process, when necessary are easily effected. This may involve changes in tooling, fixturing, heat, etc. When completed, the results are known, not guessed at. The great bulk of dollars spent on poor quality usually evolve around the following areas:
    a. Scrap
    b. Sort
    c. Rework
    d. Selective Assembly
    e. Downtime
    f. Hunting for the Assignable Cause
    g. Excessive Inspection

    Variables gaging as an in-process control mechanism provides for the avoidance of each of these costly areas.

3. Variables gaging provides for uniformity of results. Because of constant gaging pressures and visual readout, the operator element of "feel" Is eliminated. Everyone achieves the same results.
4. With variables data communications are greatly improved. Specific rather than hazy Information is transmitted.

5. Variables gaging allows the use of modern statistical quality control techniques to be implemented such as control charts, capability studies, tool life studies, etc. These techniques in most cases allow for less Inspection of the product itself because of the positive elements of control.
6. Variables gaging is easier to calibrate and maintain. Generally, It is much faster than attributes gaging.
7. Attributes gaging usually requires an operating sequence of push-pull and feel whereas variables gaging requires only a scan of the readout. Experience tells us that attributes gaging on large quantities creates excessive operator fatigue and unreliable results.
8. Attributes gaging is subject to greater wear. In the case of the screw thread the constant turning and screwing in and out of receiver type gaging creates sufficient abrasion to wear gage surfaces very rapidly.
9. Since attributes gaging wears in the direction toward minimum material, rework is costly and in many cases - Impossible.

There are numerous other technical and economic advantages relating to variables gaging. Perhaps the most profound is that when proper attributes gaging is compared to proper variables gaging cost wise it is surprising to see that variables gaging does not create much of a cost differential.

We at Johnson Gage have been intimately involved with both concepts and our involvement dates back to 1905. Since we design and build both, we feel an obligation to tell our customers that attributes control is a journey into the past while variables control is a journey into the present and future.