Advantages of Sitius Inspection Line of Software

1. *CAD Based*
   - Reduce and eliminate the need for 2D drawings
   - Unambiguous model representation – eliminate interpretation errors
   - Uniform treatment for all types of geometry – prismatic, free-form, simple, complex
   - Simplify tolerancing and move towards surface profile

2. *Integrated in Unigraphics*
   - Eliminate model translation
   - Dramatically reduce time
   - Provide 100% accuracy
   - Use 3D solid information
   - Access assemblies directly

3. *Associative inspection – data stored with the CAD model and linked to the geometry*
   - Highest level of data integrity
   - Eliminate data duplication
   - Detect engineering changes
   - Seamless updates

4. *Two-tier approach – Off-line Part Programming and Point-based Analysis*
   - Metrium – Off-line CMM Programming
     - High-volume inspection
     - Repeatability and reproducibility (SPC)
     - Unattended operation
     - High-speed measurement
     - Accurate positioning – intricate geometry
   - SPV – Part-to-CAD comparison
     - Adaptive and flexible
     - Support for DCC and manual machines (articulating arms, optical comparators, CMM)
     - Simple interface to wide range of equipment – 3D points
     - Graphical reporting
     - Speed – very short time from formulating the problem to getting the results
     - Can be used by different people and with different purpose in mind

1. CAD-based metrology is becoming increasingly important with the common use of 3D models. There are a number of benefits in going this route. Some of these include reduction and elimination of 2D drawings, explicit model representation, simplified tolerancing, support for free-form surfaces.

- It usually takes almost as much time to produce 2D drawings as it takes to build the 3D CAD model of the product. The time invested in this operation is recurring – every engineering change requires new drawings.

- The capability to provide unambiguous model representation for downstream use is significant time saver and reduces the errors attributed to drawing interpretation as well as the time spent to read and understand the information.

- With the use of 3D models for dimensional control we see significant reduction in dimensions put on 2D drawings. For example in the case of an automotive casting, at one of our customers, the number of dimensions on the 2D drawing was reduced gradually from over 2,000 to only about 250. The other trend is to move to surface profile tolerances, which are easy to define and control with CAD based applications and at the same time are very effective in the die and mold industries.

- True support for free-form surfaces is not even present with the classical 2D drawing. Normally only a limited number of control points is checked, with significant chance for cosine errors. Using the CAD model also provides an easier way to deal with complex geometry.

2. Integrating the application specific solutions into the corporate CAD system is the next important step one should consider when looking at implementing 3D metrology. This approach eliminates hidden errors, saves time and provides 100% accuracy to nominal geometry. Utilizing the Master Model concept in metrology is perhaps more important than in CAM and CAE, because this is "the moment of truth", when you are supposed to find out if the part meets the requirements.

- Going IGES for 3D inspection is as challenging as with any other downstream application. Errors, missing geometry, flavoring are all too familiar to people that have taken this path.

- The time spent translating the CAD data is exponential to the complexity of the model. With simple prismatic parts things usually work, but dealing with complex parts, molds, castings and dies the time increases dramatically. It is not uncommon to spend hours and days trying to get the model across.

- Accuracy problems and hidden errors are hard to detect when doing translations. Simple features such as holes and planes can be analyzed, but verifying the correct translation of complex free form surfaces is rather difficult and time consuming. Another problem is mapping the representation of the surfaces between dissimilar systems.

- Using the 3D solid information is very important in point analysis because it determines the material side and gives correct probe radius compensation. It also simplifies point generation for off-line programming, as the user does not have to specify the surface orientation on each step.

- Providing solution directly in Unigraphics not only provides access to assemblies, but it also allows concurrent work on the same part without modifying the individual components.

3. One of the biggest advantages in using the native CAD system is the capability to store the inspection data along with the part. This is the only way to eliminate duplication. Combined with the notification mechanism, employed by Unigraphics, it provides the foundation to build "smart" programs. They automatically react to changes in the underlying model.

- High level of data integrity – one database, exact match between part and program, reliable database engine.

- Eliminating data duplication should be a reason by itself for taking this road. Unnecessary duplication is a serious problem in any business. When it comes to information though, keeping two of the same is not only waste of space, it also has serious negative consequences. One, it requires additional efforts to update the data on each change of the master. Two, it is often the reason for errors due to using an incorrect revision. Three, causes significant delays, because it is much harder to update the programs that depend on the redundant data.

- Our software utilizes the notification mechanism available in Unigraphics to detect and flag model changes. This is achieved at software level, without any intervention needed by the user. This process is applicable to changes that affect measured points, inspection programs, features, tolerances, etc.

- We not only notify the user about the change, but we provide automatic and controlled updates to the programs that saves time, otherwise wasted in transferring the model and applying the changes to the program.

4. Two-tier approach trough Metrium and SPV. We have divided the process of inspecting a part into two steps. One is creating the CMM program off-line and two is analyzing the data collected at the CMM, including GD&T and best-fit analysis. This streamlines the process and increases flexibility. Either product can be used on its own.

- SPV advantages include wide variety of dimensional equipment, support for DCC and manual machines (articulating arms, optical comparators, CMM), inspection without programming, graphical reporting, simple interface, what-if analysis

- Metrium provides the tools to create off-line programs ahead of time. It is most suitable for high volume applications (many pieces of the same part), inspection for SPC, unattended operation, precise positioning of the measuring sensor.