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Trusted Materials Using Orthogonal Testing – 2015 Annual Report

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The purpose of this project is to prove (or disprove) that a reasonable number of simple tests can be used to provide a unique data signature for materials, changes in which could serve as a harbinger of material deviation, prompting further evaluations. The routine tests are mutually orthogonal to any currently required materials specification tests.

Materials represent the building blocks for all physical products. Unanticipated materials changes can result in undesirable and costly consequences in product reliability and performance. These changes may result from a vendor's process improvements driven by technological advances and/or economic considerations. Of greater concern is the manufacturer's, and in turn the consumer's, vulnerability to potential nefarious actions. The functional impact of integrating dubious materials into the manufacturing process spans the range from processing and fabrication through reliability assessment activities, as anomalies may manifest early or be aging-related.

One method of addressing the materials assurance process is to use an array of material specifications. Functionally, these specifications may range from weak (manufacturer part number) to robust (a comprehensive series of physical or chemical tests). However, the potential for detrimental material changes going undetected while using the existing specifications dictates that we develop a new testing paradigm to verify that materials are precisely those that are required for their intended purpose.

We have proposed a new approach for assuring materials, complementing the current specifications process. The orthogonal testing (OT) approach could be a complete paradigm shift for how we accept incoming materials and fabricated parts. In this new paradigm, we would only use OT during refurbishment to determine that the material is, or is not, from the same family that was qualified.