

## Computerized Realtime X-Ray Inspection of Consumer Waste Product for Hazardous Materials

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### ABSTRACT

*This presentation describes the design and manufacture of a computer controlled x-ray scanning system for the fully automated inspection of waste for hazardous materials. Of particular importance was the necessity to accurately detect various sizes of propane tanks and large heavy metal objects. In addition, rejects had to be accurately identified and each image saved for archival requirements. The equipment utilized, material handling, software development and implementation is detailed herein. The problems of establishing a stable image in a harsh environment required ruggedizing all of the components as well as positive pressure air delivery and air conditioning of the computer and related electronic enclosures. The use of commercially available equipment and latest detector technology were utilized as much as possible to reduce costs and to provide a reliable low maintenance system that also included the ability to conduct diagnostics and software upgrades remotely via computer.*

### INTRODUCTION

The implementation of conventional x-ray imaging, ie., image intensifiers, standard linear diode arrays (LDA's) in the inspection of waste could not be employed due to the various size conveyor tunnels, height of waste product and speed. This type inspection had to be conducted under very adverse conditions and in some instances continuously 24 hours a day. It was not possible to stop the stream of waste from the tipping floor nor to control its distribution within the conveyor. Until recently realtime x-ray has also been employed in numerous industrial applications but primarily as a manual operation where a technician makes the final acceptance or rejection decision. Computer processing of digitized radiographs has also emerged as has some automated systems where pattern recognition has been the main criteria for accept/reject analysis.

The instant requirement was to develop a fully automatic inspection system capable of inspecting waste automatically while providing a visual and audible signal to the crane operator of suspect contaminants. The operator would stop the line briefly while picking the suspect object from the conveyor. Conveyor size, speed, and depth of waste had to be taken into consideration when coming up with a design that would satisfy most if not all similar inspection applications. Until now this inspection operation was strictly manual, left to the tipping floor staff or crane operator. Undetected propane tanks that reach the shredder could result in a