



## Example: Explosives & Contraband

There are many types of neutron interactions which have been proposed and demonstrated for security applications.

X-ray systems dominate but the weakness of x-ray systems and human operators to identify explosive material itself is well documented.

Among the array of neutron techniques, we can find thermal neutron capture. This enables an unusual abundance of nitrogen to be detected as a gamma spectrum peak. Most explosives are nitrogen rich.

Concepts for the scanning of individual items of baggage with neutrons have required a stop-start-stop-start movement of the object into the scanner. In some cases, the isotropic neutron source has been placed in the middle of a circular conveyor so that more scanning stations can be used simultaneously.

NSD-GRADEL-FUSION and another company have independently conceived the concept of the neutron scanning tunnel which avoids the stop-start stress on the conveyor and associated delays. The NSD linear or distributed multi-head neutron generator provides the geometry necessary for efficient shielding and positioning of the scanning stations along the conveyor, straight or curved.

The speed of transit through the security screening tunnel can be maintained at normal conveyor speed. The neutron output can be kept as low as practical or (As Low As Reasonably Achievable - ALARA) because the individual scanning station gamma spectroscopy data per object can be synchronized or commutated with the speed of the objects on the conveyor. Therefore the total scanning time per object can reach a level of statistical significance to assure a minimization of false positives.

The NSD neutron generator provides long neutron emission chambers or multi-head configurations which have operation lifetime of many years. The servicing interval will not be dictated by a central cartridge that burns out or erodes in just a few thousand hours of operation. Life cycle economics are most attractive. The configuration or arrangement of gamma detectors, shielding, moderator and neutron generator can be varied to suit.

A project to deploy a neutron baggage screening tunnel will involve:

- A launching customer driven by a desire to avoid air traffic disruption when critical alerts reveal the inadequacy of x-ray screening
- a baggage logistics study for the airport to determine the optimal locations and specifications (we can recommend an experienced consultant)
- construction of the deliverable machine (network of suppliers including the system engineers)
- deployment and maintenance

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