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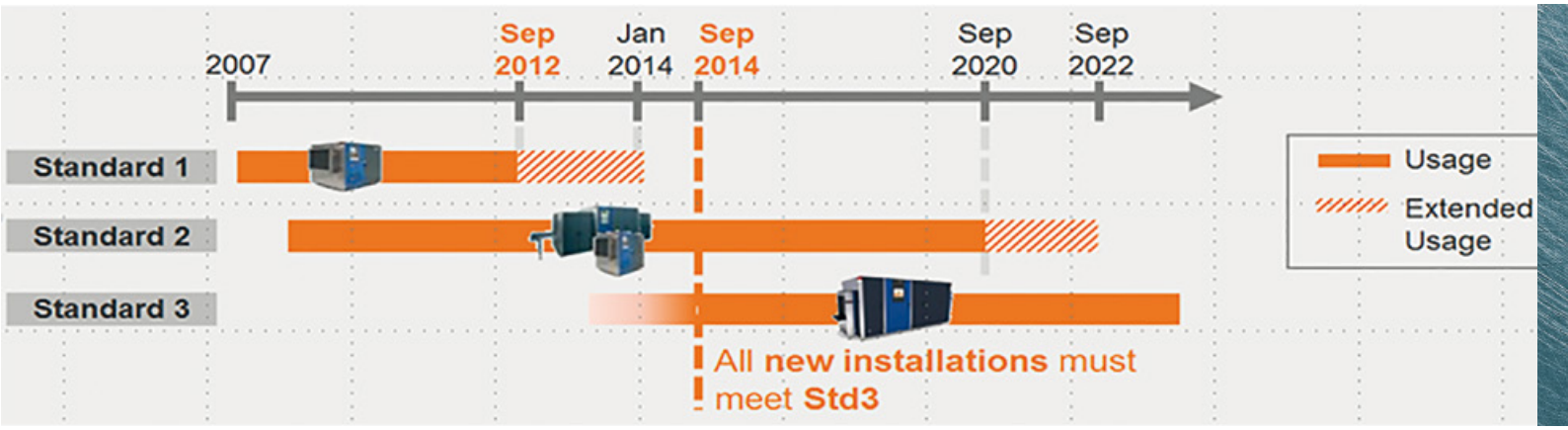


ASSESSING THE IMPACT OF ECAC3 ON BAGGAGE HANDLING SYSTEMS – CONSIDERATIONS FOR UPGRADING EXISTING ECAC2 SYSTEMS

WHAT ARE MULTI-LEVEL SCREENING AND ECAC STANDARDS?

ECAC standards was made mandatory for all airports in 2007, and in September 2014, European airport security underwent a major change. After that date, all newly-installed equipment going forward must adhere to ECAC's new Standard 3. The approved screening machines employ some kind of CT technology at the primary level 1 device. The European Civil Aviation Conference's (ECAC) Standard 3 threat detection test is the highest standard set by ECAC for the detection of explosive threats in passenger hold baggage.

Multi-level screening is a fundamental requirement of the ECAC regulations. The idea of screening bags at different levels is to be able to screen and approve the majority of the bags as fast as possible. Bags that fail the screening process are diverted from the main flow and moved to another screening level where further, slower manual investigation is undertaken. The in-line multi-level screening approach set out in ECAC Standard 3 is designed to be able to screen the baggage in-line, faster and more cost efficiently.

This whitepaper examines the impact the changes have on existing ECAC2 baggage handling systems and how to implement the necessary changes.

THE EVOLUTION OF ECAC STANDARDS

ECAC Standard 1: Dual Energy X-ray and single operator image; set the base line data for Probability of Detection and False Alarm Rate. Standard 1 has been in use since January 2002 and was made mandatory for all airports in 2007.

ECAC Standard 2: Dual Energy X-ray, dual operator images; specifies that for the X-ray unit the Probability of Detection must be higher than Standard 1 and the False Alarm Rate must be lower than Standard 1; image quality parameters, resolution, wire detection, steel penetration, organic/non-organic discrimination.

ECAC Standard 3: Dual Energy X-ray + Computed Topography (CT) technology, single operator image; specifies that for the X-ray unit the Probability of Detection must be higher than Standard 2 and the False Alarm Rate must be lower than Standard 2; image quality parameters, resolution, wire detection, steel penetration, organic/non-organic discrimination (very close to US TSA standards for BHS).

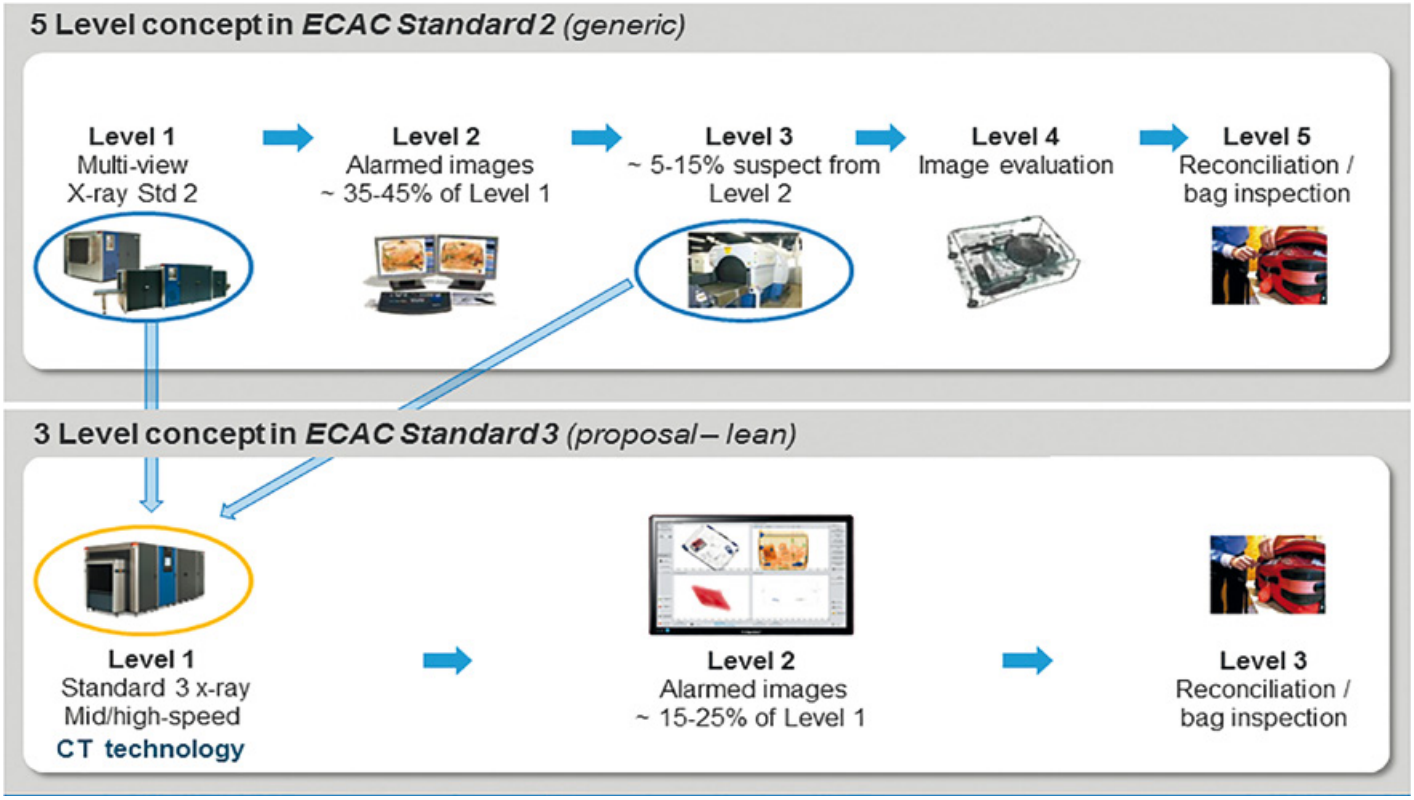


Figure 1 Comparison of ECAC Standard 2 system with a proposed ECAC Standard 3 system

HOW DOES ECAC 3 AFFECT EXISTING SYSTEMS?

An ECAC Standard 3 BHS system would incorporate just one level of screening machines and therefore removes the need for additional stage processes of previous ECAC Standard 2 five-level BHS systems in which the primary detection technology would normally be a dual-source x-ray machine operating at level 1 with CT (computed tomography) technology at level 3, as can be seen in figure 1 above.

WHAT ARE THE ADVANTAGES OF THE ECAC 3 STANDARD?

The main changes specified by ECAC3 result in an increase in security standards and an increase in system availability and throughput. The modern CT machine can process up to 1500 bags per hour, which is the same as a traditional dual energy X-ray machine. However, the traditional X-ray machine only cleared approximately 70% of all bags, restricting its approval capacity to around 1050 bags per hour. The CT technology-based machines clear approximately 80% of all bags giving it an approval capacity of around 1200 bags per hour, effectively giving it a higher handling rate.

Optimising the design of the BHS in this way may reduce the number of screening machines required, and can also offer a potential reduction in the number of operators required to run the system. Utilising only one type of screening machine, an ECAC Standard 3 BHS may also allow airport operators to optimise maintenance and reduce the spare part inventory.

As Standard 3 is simpler, changing from Standard 2 to Standard 3 will release some space in the baggage hall for other purposes.

WHAT ARE THE KEY AREAS TO CONSIDER WHEN PLANNING THE UPGRADE TO ECAC3?

System Design

The main system design consideration is that baggage handling system designs can now be made simpler.

Figure 2 shows details of a typical five-level multi-screening concept; the system has to distinguish suspect and safe bags at two levels of machines, both of which require re-routing. However, in figure 3, detailing an ECAC3 system, the design only requires the incorporation of a single level of machine screening and therefore not only reduces the number of machines and routes, but also the overall footprint of the system.

SYSTEM CAPACITY AND REDUNDANCY

Achieving the right system design will offer a fast and easy baggage flow management solution where the hold baggage screening area can cope with the maximum throughput capacity of the baggage handling system. With the hold baggage screening being an integral part of the baggage handling process, the system has to be designed to balance loads between redundant routes to ensure optimum usage of available Explosive Detection System (EDS) resources to keep the number of screening machines to a minimum.

Figure 2 ECAC Standard 2 multi-level screening (5 level)

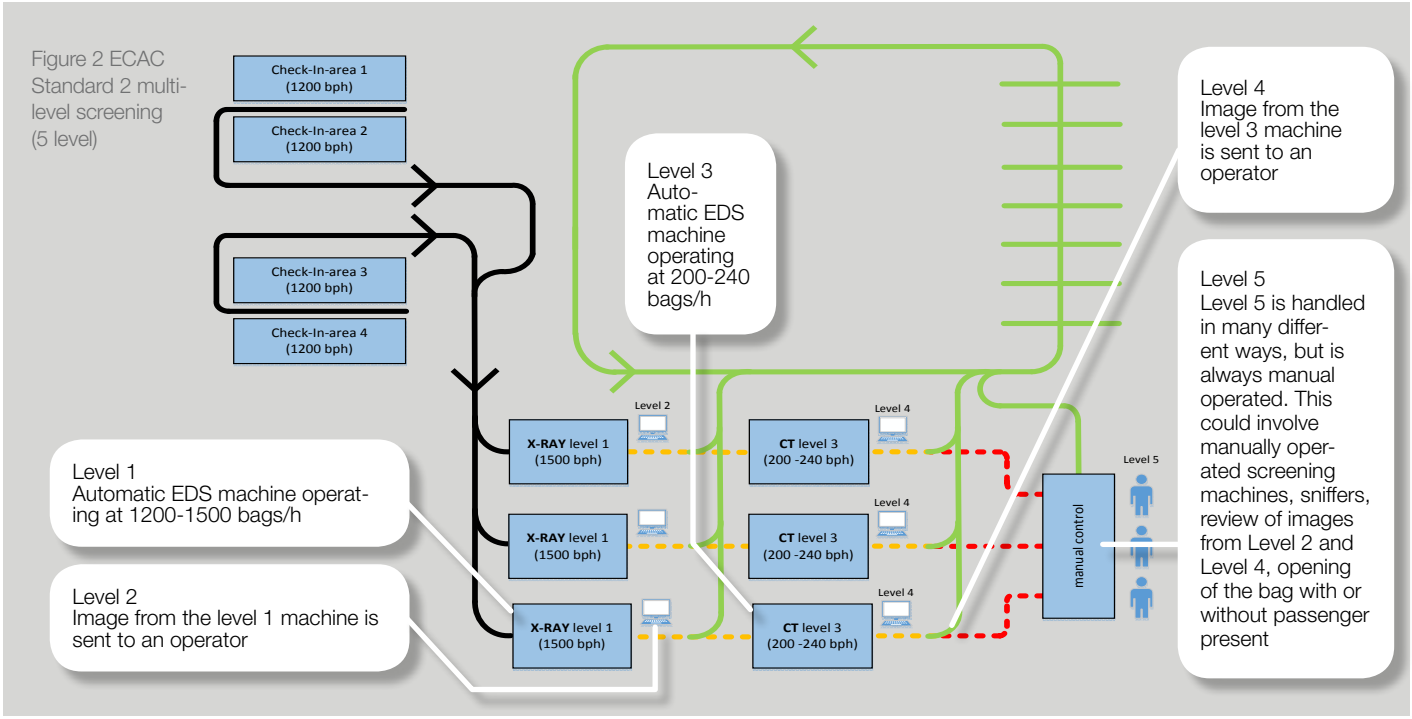
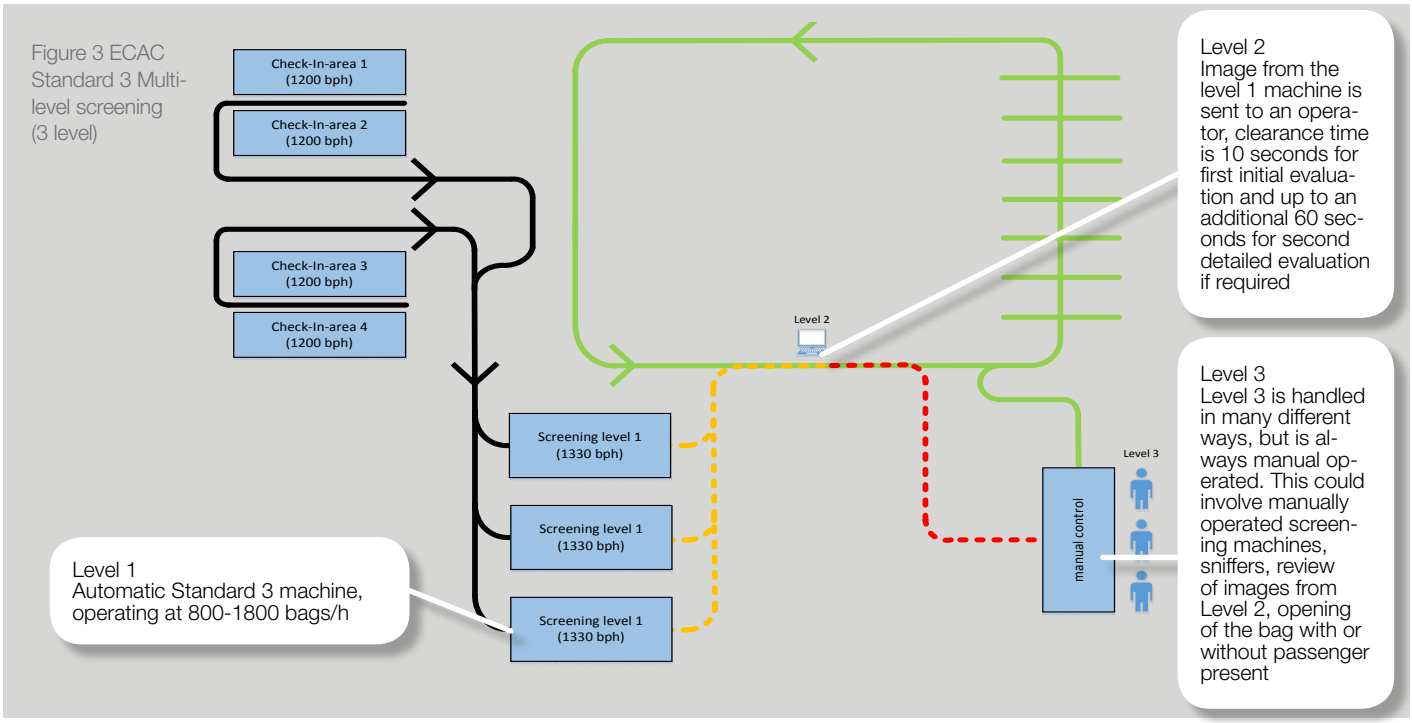


Figure 3 ECAC Standard 3 Multi-level screening (3 level)



Upstream, the system has to balance the baggage load to avoid back-log towards the check-in areas. Baggage congestion really has a negative effect on the passenger check-in experience if they leave the area without seeing their baggage enter the bag-gage handling system.

Downstream, the baggage handling system also takes into consideration how to avoid bottlenecks towards and between the EDS lines. The baggage handling system controls will determine the optimal route to destination while baggage is already on its way through the system. This type of “on-the-fly” destination determination will ensure each bag is cleared immediately into the baggage handling system. (To reduce the risk of delayed bag-gage and subsequent negative airline and passenger experience.)

COMPLIANCE AND OPERATION

The exceptionally high level of security offered by Standard 3 screening requires that the baggage handling system can guarantee complete tracking of all bags. If the screening decides that a bag is suspect and it needs to be recalled or re-routed for inspection, the system must be able to instantly trace where the bag is to deal with it speedily and effectively.

In a typical Standard 3 system, during screening, security operators have 60 seconds of variable decision time to determine the status of a bag without interfering with bag flow before the system clears the bag for the sortation system or sends a suspect bag for manual process.

In general, the Standard 3 system dramatically improves the baggage screening and evaluation process by reducing the rate of rejected bags and combining levels 1 and 3 into one level. The reduction in process levels does away with the need to install conveyor equipment at levels 3 and 4. The operator at level 5 now becomes the new level 3.

In addition to the ECAC Standard 3 compliance, hold baggage screening also ensures that all bags are screened according to international recommendations using the following levels:

- Secure Airport – where transfer baggage from airports has a secure status
- Risk Flight - enables forced high-level screening

Complying with the new Standard 3 regulations is more than removing the existing screening systems and replacing them with new machines. Careful attention to design is needed as already mentioned and leads to an opportunity for reduced CAPEX where design optimisation reduces the anticipated number of hold baggage screening machines.

In addition there is an opportunity to reduce the OPEX, for example by optimising the complete baggage handling maintenance. Costs may also be lower when the airport includes scheduled HBS maintenance as part of the overall preventive baggage handling system maintenance. Indirectly, load balancing also results in a more distributed use of the entire system, which leads to reduced component replacement and purchasing.

With the right design and daily operation of the system, ECAC Standard 3 used optimally will add to keeping the cost per passenger/bag to a minimum, as well as increasing passengers' safety to the maximum.

BENEFITS OF COMBINING CT TECHNOLOGY WITH A TOTE BASED BHS SYSTEM

To ensure that an airport's BHS maintains the required throughput, a great companion is a 'tote- based' baggage system. A key characteristic of a tote-based baggage handling system is its ability to handle higher capacity throughputs. It has been proven that a tote system is capable of running at 1,333 bags per hour through an ECAC Standard 3 machine.

A tote system provides unique traceability of bags, which is a fundamental requirement of ECAC Standard 3 compliant BHS systems and by design, does not jam, offering constant spacing of bags in the system.

Screening equipment for ECAC standard 3 is based on a CT technology, hence the price for a machine is higher than it was for a conventional X-ray unit. Better load sharing to fewer machines is of high importance. By balancing the load from the check-in area equally to all machines available, the utilisation of the screening equipment is optimised. Typically something resembling a transport loop around the screening area allows for simple distribution as well as recirculation of bags that require to enter the screening line a second time.

For larger systems the screening systems are usually more distributed and spread between two or even more areas, which will then have to be linked by a reliable and flexible transport system. Here a tote system can show its strength – higher speeds with a very reliable tracking of data and a flexible distribution for best utilisation (of as few screening areas as possible).

CONCLUSION

While ECAC Standard 3 is a regulatory requirement, it provides an opportunity to transform an airport's BHS infrastructure to gain higher efficiency and performance.

Any additional costs are offset and partly compensated by reduction in staff and higher efficiency in BHS/HBS design.

The high initial cost of the machines makes it even more important to optimise fully the machines' use by load sharing. Moving between ECAC Standard 2 and ECAC Standard 3 is like performing "Open heart surgery" on the BHS system. Any integration of new technology into a live system requires a careful and well-timed planning.

Sources: https://www.ecac-ceac.org/

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