



CURRENT STATE, TRENDS AND THE USE OF LIGHT CONVEYOR BELTS ON AIRPORTS

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Abstract:

The safety and regularity of air transport is closely linked to the performance of individual activities in its structure, including airport operations management and quality of business and technical equipment. This article describes the triggering process of passengers - especially his luggage handling and demands for technical, safety and quality requirements for transporting, loading and unloading luggage and cargo intended for carriage by air transport. The stated requirements are associated with innovative methods, technical and software components of individual air transport of luggage and cargo.

Key words: *light conveyor belts, commercial handling in air transport, quality of provided services*

1 INTRODUCTION

Air transport is a dynamic transport system, which consists of disparate parts. It just does not create individual flying, as well as support systems of the airport. Each air passengers can also benefit from the advice offered services located at the airport, from gastronomy, accommodation, relaxation and others. These systems have the one common goal, to make pleasant the stay of passengers. To this it is needed to create a system, which allows to store the luggage to loading to the airplane at any time regardless of the time of departure. For the right realization of all requirements, it is needed to have good “brain” of this system, i.e. software, which manage the whole process, and also realize ground handling of airplanes, technical and commercial handling [1]. Ground handling of airplanes presents the system of activities which are realized at the airports for operation and operational capability of airplanes which use the term “technical handling”. It is presented by specific activities at the apron (Ramp service) - controlling of airplanes, loading and unloading of luggage, boarding

of passengers, de-icing of airplanes, etc. The other category of these activities is airplane cleaning (Cabin Service) and replenishment of foods and beverages (Catering Service). The commercial handling is a part of airport operation and this name is Passengers Service. They are presented by the services for passengers and their luggage. Commercial handling provides:

- all activities associated with the process of passengers and their luggage and transit/transfer departures, waiting rooms,
- preparation, processing and archiving of operational-commercial documentation of checked – lines,
- selection of different fees which are required by standard airlines, such as overweight of luggage, security costs, etc.,
- control of passengers boarding,
- activities related to the claim of lost and damaged luggage, organization of delayed luggage transport to the client, etc. [2].

2 CURRENT STATE IN THE USE OF LIGHT CONVEYOR BELTS

From the perspective of passenger the handling with luggage at the airport is limited to its allocation at the handling belt. Subsequently the luggage is scanned, weighed and transported to the sorting systems of the airport and loaded to the airplane. After the end of transportation, the passenger pick up their luggage at the handling belt [3].

Light conveyer belts are used mainly for internal transport of unit costs, for example packages, boxes, cans, containers, industrial goods of all kinds, food and luggage. In many cases, the light conveyer belts are integrated directly to the device – in such cases we talk about “machine belts”. In this function they realize only transport element, which participates in the production activity, or only in the process of production. In many cases, they are lightweight conveyer belts incorporated directly to the machine - in such cases we speak of "machine belts." In this capacity, they carry out only the transport element to be additionally involved in the production activity, or only in the production process. Machine tools using strips of clean transport function are, for example: packaging machines, vending machines, machines for the processing of paper - printing, cutting. Machine tools using bands that are involved in the production activity and are used in the manufacturing process are e.g. cigarette making machines, folding a newspaper, the processing path, chocolate. Another group of machine belts with special names - folder-gluer belts (gluing machine), tube-winder belts (the tube winder), printing blankets (printing prikrivok, blankets), processing belts and drying, coating, partial board manufacturing (drying, the coating chipboard).

Easy conveyer belt for transport of bulk materials are in chemical, pharmaceutical, cosmetic, food, agricultural industry and food and tobacco processing industry. They are almost used inside, and in the case of outside used, they are under protective cover (example of transported material granulated or powdered material, maize, rice, fruit, vegetables, tobacco, split, saw). Outdoor use of light conveyer belt is rare. The strength of easy conveyer belts in tension is determined primarily by connection of layers of synthetic fabric, layers connected by binding material or by intermediate product of different thick layers – typically thermoplastic.

3 CHARACTERISTICS OF LIGHT CONVEYOR BELTS

The cover layers on the both sides are fully functional, equal by material, thickness and

texture. All of their combinations are possible – without coating, with thin impregnation to very rough surface. Coating compositions can be thermoplastics (PVC, TPV), cross-linked synthetic and many more, and this in different hardness. Light conveyor belts are almost produced in large widths (up to several meters), and then cut to any required size. Sizes of light conveyor belts are not standardized, it would not be appropriate because the light conveyor belt are used mainly for non-standard installations. The total thickness may vary from a few tenths of a millimetre to several millimetres depending on the specific application of the belt (10 mm and more in the case of use in paper industry). It is possible to change the width from 10 mm (machine belts) to several meters (industrial belts). The lengths vary from 500 mm to 100 m [4].

As it was mentioned in the article, the properties of conveyor belts may vary within the wide limits and they are designed so that they meet very specific demands. Belts which fully correspond to the standard STN EN 12882 and ISO 340:2013 (Conveyor belts for general use – requirements for electrical safety and flammability) – silent fabric, abrasion resistant with high or conversely low adhesion, anti-static, with low stress, etc.

Nominal tensile strength varies from less than 100 N/mm of the belt width to several hundred N/mm of the belt width (it can be up to 1000 N/mm of the belt width by highly specialized belt structures). Maximum permissible load is 1/10 of the nominal tensile strength.

There are many unique profiles and methods in practice for merger of specific types of products in the field of distribution, process and conveyor belts to meet the following requirements of air transport:

- Check - in & weighing - in the departure areas of airports, luggage is weighed at the air terminal and then it is transported by conveyors to the sorting hall of luggage. Weighing systems require special characteristics, the belts have profile suitable for transport of roller suitcases.
- Transport/Merge & take- away – depending on the transported goods may be required different qualities: high friction and low abrasion value. To cover of all possibilities there is a wide range of belts – modular, curved or timing belts. But all offer the same high performance.
- Transportation/SORTER – it is operated from several collecting conveyors from check-in, its hourly capacity, it must be sufficient for luggage handling.
- Sortation/ Pusher & (belt) collector – these conveyor belts should handle complex process of sortation and quality material ensures their maximal durability. They are pullers, shunting equipment for merger – all these belts have special finishes that ensure maximum strength, adhesion and easy luggage transport.
- Scanning/X-ray security – security control before departure, screening of luggage and system of explosives detection present the problem number one. Therefore it is needed high quality of screening belts.
- Sorting systems/Tray – intelligent systems of conveyor belts for effective handling with luggage offer innovative solution from sortation to the luggage issuance.
- Transport/Curve – material of conveyor belts is developed and tested by the way that it can realize loading to 250 kg in the field of curve.
- Loading/Belly loading – loading and unloading of airplane – it must take into account heat resistance of conveyor belts with excellent adhesion and monitoring of properties in duplex direction. Conveyor/belt loader (Beltloader) - this conveyor is used for quicker and easier loading of luggage from the check-in area to the cargo hold of the airplane and it ensure easy transport of luggage.



Fig. 1 Belt luggage conveyors in air transport

Loading and unloading of the aircraft takes place in any weather it must be taken into account heat resistant conveyor belts with excellent adhesion and endpoints in two-way direction. Conveyor / track loader (Beltloader) - This loader is used for quicker and easier loading of luggage from the apron into the hold of the aircraft. Luggage interpreted ground-handling of baggage carts onto the conveyor loader. The conveyor transports the baggage loader to the storage compartment of the aircraft, where her luggage services personnel deployed against loading instructions [5,6].

Each airport has its own requirements for technical solution of luggage sorting depending on the number of handled passenger per hour. On the base of this design parameters it proposes a specific system for the specific airport. Basic technological requirements is an hourly capacity. The total capacity of the systems is a value which consists of the capacities of conveyors. Roller loading systems are also use at airports, which moved the luggage by rotating driven rollers [7].

4 DEVELOPMENT TRENDS

The growing volume of air traffic is the result of increased global goods exchange, division of labour in worldwide basis and particularly the growth of e-commerce (delivery service, business enterprising and agricultural products). Air transport can be divide into two major areas:

- courier, express and parcel consignment (foil bags, oversized letters, parcels – 40kg pack), chaotic packaging of structure,
- distribution and services (identical packages, uniform structure, often in the final package for the customer) require delicate handling.

Parcel logistics is characterized by a sharp increase of the traffic volume, the current capacity is 20 to 40 000 parcels per day. The largest airport companies expected increase to 100 000 pieces of luggage per day. One of the ways, how to meet this increase of demand, is to use transport and handling systems with new functional structure of the concept – combining different types of conveyors and their constant upgrading (by improving individual components to the super intelligent control system).

Due to different characteristics of inhomogeneous cargo objects (dimensions, weight, shape, texture, stability, humidity, quality of covers, deformation), it requires a high level of skills of the labour force.

Engineers are faced with the task to design a system for automatics handling of cargo objects in accordance with the following specifications:

- packages and luggage with the weight up to 40kg,
- dimensions from 100x100x10 mm to 1200x800x600 mm,
- flow more than 3000 units per hour,
- high level of reliability and safety.

To fulfil of the above described system for automated cargo handling, it is evident the need to focus the research and development to the creation of automatized system which is able to realize these two functions:

- soft reliable delivery and
- trouble free changeover to the stated place.

The latest technologies of sorting and luggage transport from the check-in counters to the plane have an integrated radio frequency identification system (Radio Frequency Identification - RFID). New brands which combine built-in RFID chip with the bar code replaced old bar codes used by air carriers. RFID tags can be read from larger distance, angle, with larger speed, contain more data and they are more reliable (up to 97% versus 80 % in the bar code). By this system with using of other intelligent control elements it is possible to sort and transport up to 40 000 pieces of luggage per day. For general transport of packages is intended the product Siemens VarioMove – collection of packages to be stored in containers. Semi-automatic handling parts of the device EmpticonFa Qubiqa present one of the examples which is control by one person using the joystick [8, 9].

5 CONCLUSIONS

For safe and high quality manipulation with baggage in air transport producers dealing with distribution systems at airports constantly improve existing and develop new complete systems for various traffic volumes of passengers and thus their luggage. For example the company Vanderlande offers a wide range of airport sorting and transport systems and technologies which are presented by vertical and also horizontal sortation and by parallel pressure combined system Viper. Innovative transport and sorting system Baxorter is specially designed for small and medium-sized airports based on the technology Triplanar.

The systems offers a cost effective sorting of luggage and meets a wide range of requirements of individual airports. It has the ability to process up to 3000 containers/luggage per hour with high flexibility for the required number of outputs to different flights and destinations. This provides flexibility of arrangement and wide range of system configuration for possible development of the airport. This makes from it an ideal sorting and transport technology for screening application, where it is necessary to realized safety devices to prevent risk situations in the selected trip process of passengers and their luggage.

Similar systems are already in large airports with high volume of passenger exceeding tens of million per year and just by their development it is possible to find them at small regional airports. But from this fact results the task of upgrading of elements of the mentioned device, especially the transport system which consists of light conveyor belts of various design and configuration.

References

- [1] Polák, J., Pavliška, J., Slíva, A.: Dopravní a manipulační zařízení, 1. vyd., Ostrava: Vysoká škola báňská - Technická univerzita, 2001, 99 s., ISBN: 80-248-0043-8.
- [2] Straková, E., Ferenc, J.: Prostriedky pre pozemnú obsluhu lietadiel, vydanie I, (2011), ISBN: 978-80-553-0706-0.
- [3] Hlavenka, B.: Manipulace s materiálem: systémy a prostředky manipulace s materiálem, vyd. 4., Brno: Akademické nakladatelství CERM, 2008, 164 s., ISBN: 978-80-214-3607-7.
- [4] Európska norma: Ľahké dopravné pásy, časť 1: Základné vlastnosti použitie, ISO 21183 – 1: 2005.
- [5] Ammeraal Beltech, produkty v oblasti manipulačnej techniky, transportu a logistiky. Dostupné na internete:
http://www.ammeraalbeltech.sk/Belt_C01/Modules/PaginaA/PaginaA_Module.asp?CustID=609&ComID=31&ModID=892&ItemID=0
- [6] Arnold, D.; Kun, A.; Isermann, H.: Handbuch Logistik, ed. Springer, 2003, p. 1072, ISBN-10: 3-540-40110-5, ISBN-13: 978-3-540-40110-0.
- [7] Airport Handling Manual, IATA Ženeva, 2015, ISBN 978-92-9252-458-6.
- [8] Jeřábek, K.: Doprava, manipulácia, skladovanie - logistika, Stavebný Informácie, XI (28), 2004, 3-31 s., ISSN 1211- 2259. (original in Czech).
- [9] Airport-technology, server zameraný na najnovšie správy o letiskových projektoch, trendoch, produktoch a službách pre odvetvie letísk. Dostupné na internete:
<http://www.airport-technology.com/contractors/baggage/vanderlande/>