Conveyor belt fire safety: A new proactive way of thinking

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Introduction

At present a paradox exists between the legislative requirement and the code based designs for the fire protection systems deployed for conveyor belt installations.

The 'Mandatory Code of Practice for the safe use of conveyor belt installations' under paragraph 8.4 (1) requires the employer to prevent persons from being exposed to flames, fumes and smoke arising from a conveyor belt installation catching fire.

The current based designs are reactive in their methodology demanding extreme temperatures or flames to detect and react to a fire. These systems therefore do not aid in the prevention of a person's exposure to flames, fumes and smoke.

In addition to the Mandatory COP (1) in Annexure B under the heading 'Fire Detection', there is a requirement for fire detection along the conveyor belt installation as the belt material can however also burn and give off noxious gasses.

Current fire detection systems utilized underground and in conveyor tunnels lack real-time information on the exact position, temperature, scale and direction of the fire and are based on point type gas detection.

Implementation

Advanced Automated Systems researched the relevant fire standards and codes and compared them to the requirements of the Mines Health and Safety Act (2) and concluded that the current available sytems are not going to provide compliance. Thus a new proactive approach was developed to meet the challenges set by the MHS Act (2) and Mandatory COP (1).

A series of tests were conducted on a mock-up conveyor to establish a test protocol to determine the effectiveness of the newly developed system, tests were performed on the response of the Lehavot Delta Detector to rapid changes in temperature, and fire tests were performed to assess the effectiveness of the Forrex liquid utilized by the Dafo system.

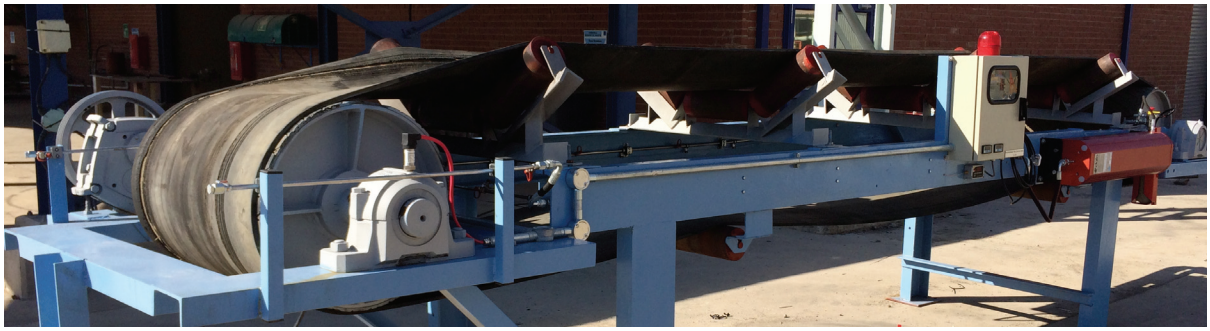

Figure 1 – Mock-Up Conveyor with Delta Detector and Forrex System Installed

For the detection along the conveyor belt installation, research lead to fire detection systems utilized with in the transport sector specifically in Europe's long underground tunnels.

The leading system utilized is the Lios De.Tect state of the art frequency domain based distributed temperature sensing system measuring the temperature by means of optical fibres functioning as linear sensors where temperatures are recorded as a continuous profile along the entire sensor cable.

The controller analyses the fibre optic sensors for every 0.5m up to 10km in length with a resolution of 1°C or better and with a response time of 4 seconds or less continuously, As a result the exact fire location, temperature and spread are accurately monitored along the complete conveyance installation.

Figure 2 – Lios De.Tect LHD Controller

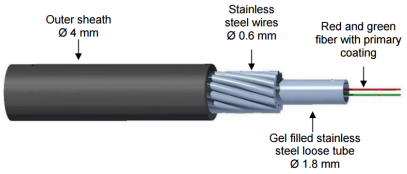

Figure 3 – Lios De.Tect Sensor Cable

Conclusion

The proactive approach to conveyor belt safety enables the compliance to the Mines Health and Safety Act (2) and Mandatory Code of Practice (1), and with real time temperature information for the complete conveyance system effectively increases employee safety and a lower probability of loss in production continuity due to a fire.

By installing the Lehavot Delta pneumatic-electronic linear heat detector within the conveyor framework at the designated areas the rapid change in temperature can be detected before the ignition temperature of the conveyor is reached.

In addition to this, the automatic actuation of the Dafo Forrex wet chemical fire suppression system with its unique fire suppression abilities further inhibits the probability of ignition and re-ignition thereof. The Dafo Forrex System's nozzles and pipework are installed within the framework of the conveyor at the designated areas.

In addition the systems are scalable to the operation and provide immediate protection to the area where it is installed without the sizable investment required by complex water infrastructure and the damage caused by associated flooding of code based systems.

The new developed system in its non-complex design facilitates ease of operation and due to the limited maintenance required compared to complex code based reticulated systems provides higher levels of reliability and availability in the case of a fire.

A proactive approach to fire safety saves lives and can be applied to various applications within the mining environment, especially Trackless Mobile Machinery, transformers and hydraulic power systems.

References

(1) Government Notice R1024 in Government Gazette 38339 dated 19 December 2014. Commencement date: 30 November 2014: Guideline for the implementation of a mandatory code of practice for the safe use of conveyor belts installations.

(2) Government Notice R93 in Government Gazette 30698 dated 1 February 2008, Mine Health and Safety Act, 1996 (Act No. 29 of 1996), Regulations, Chapter 8: Machinery and Equipment.

The Author

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Herbert Schmitz is the co-founder of two companies namely Advanced Automated Systems which specializes in engineered risk solutions and AMIT Technologies which currently holds two international patents and several intellectual properties within mining safety.

By utilizing his experience in the mining sector and developing unique state of the art engineered solutions for fire and other operational risks Herbert together with his partners currently hold the distribution rights to some of the world's leading technologies namely Dafo, Lios-Tech, Telefire, Lehavot and FirePro.