Material Handling: Applying NFPA 79® and Other Standards to Machinery Emergency Stops

An Online Continuing Education Course for Engineers

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Material Handling: Applying NFPA 79 and Other Standards to Machinery Emergency Stops

David Nowicki, P.E.

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1.0 Introduction

There are many examples throughout various industries which use packaging or material handling equipment to process, load, stack, modify, check or convey products. Each process will require various stopping methods under emergency and non-emergency conditions. Manufacturing of metal goods, mining, can production, insulation production, mold injection processes are just a few examples.

To illustrate this point, Figure 1 shows a typical material and handling process for aluminum cans.

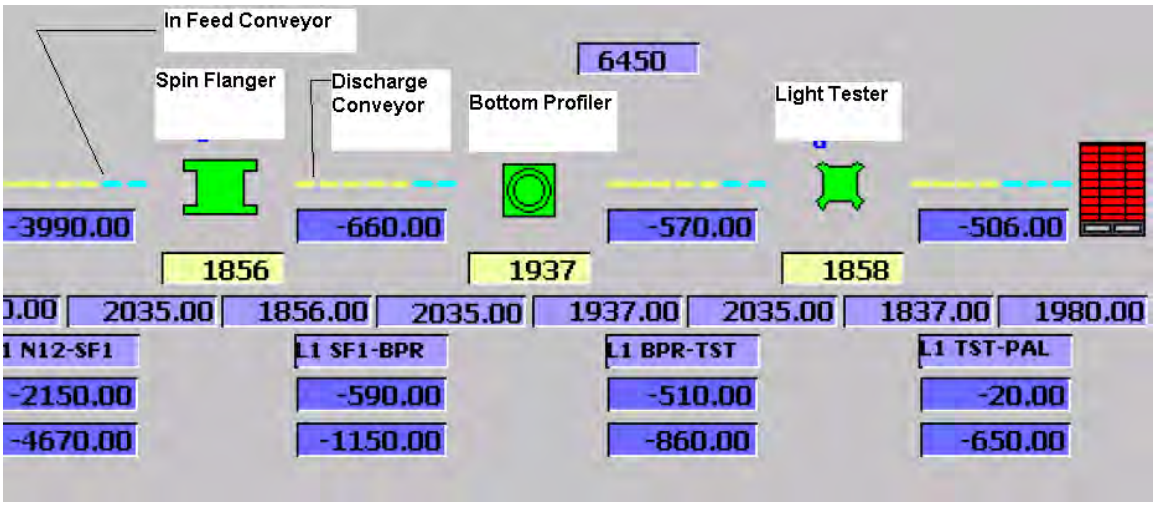

Figure 1 - Typical conveyor system linking various process machines.

Figure 1 is based on a typical layout of an aluminum can manufacturing line for the later stages of aluminum can production. Equipment used in the later stages consists of separate processing units which include:

- Mechanical belt fed conveyor systems for conveying cans to/from different processing systems
- Spin flanger - used to put a flange on the top of a can for the lid
- Bottom profiler - used to the ridge on the bottom of the can
- Light tester - a quality check used to check for holes in a can
- Palletizer - used to layer cans on a pallet

Each of these pieces of equipment is a separate system available from separate specialized equipment manufacturers. Each has an in-feed and discharge conveyor that has speed modulation in order to match the speed of each processing system.

The spin flanger, bottom profiler, and light tester will most likely comply with the requirements of NFPA 79®. They are generally part of a machine provided by a single OEM.

The infeed and discharge conveyors will be provided by a separate company and will generally be on a VFD for line speed control. Conveyors will typically have E-Stops, pull cords and light curtains.

Questions often arise about the standard design approach. Namely, how does the E-Stop circuit for the conveyor drives need to interlock with equipment upstream and downstream in order to comply with standard practices? Does the circuit also need to be compliant with NFPA 79®? Are there ramifications associated with making a VSD drive emergency stop circuit NFPA 79® compliant?

2.0 Industry Standards and Regulations

The terms E-Stops and Safety Stop circuits are referenced and used somewhat interchangeably. Generally these imply personnel protection. Based on industry practice for machinery, two standards typically apply for equipment - NFPA®, and EN Standards (International equipment manufactured for European markets).

NFPA Standards and NFPA 70

NFPA 70®, is know in the United States as the National Electrical Code (NEC)®, and is widely accepted by states, municipalities and cities throughout the United States. It is typically adopted by the local authority having jurisdiction and becomes the law. The NEC® covers safe wiring practices for buildings and equipment and comes the closest to a national standard.

Generally, the NEC®, does not define an emergency stop or its use except in limited cases. There are some references to emergency controls used for motor fueling stations and bulk storage plants. Also, there is an emergency stop used in an informational note in NEC®, Article 620 Elevators, Dumbwaiters, Escalators, Moving Walks, Platforms and Stairway Chairlifts.

Furthermore, the NEC®, references NFPA 79® in the context of wiring for industrial machinery and in Articles 670 Industrial Machinery®. In Article 670®, there are two informational notes relating to the definition of nameplate data, size of over current protection, and supply conductors to industrial machinery. NEC®, Article 670® directs the reader through informational notes to NFPA 79® for further information and for workspace clearances for machine power and control equipment.

> NFPA 70®, National Electrical Code® and NEC® are registered trademarks of the National Fire Protection Association, Quincy, MA.

NFPA 79®

Machinery designed in the US typically follow NFPA 79 – Electrical Standard for Industrial Machinery®. Emergency or safety stops typically require safety rated relays and specific wiring modifications in order to meet the requirements for personnel safety.

There are 3 categories: 0, 1 and 2. These are based on the type of stopping which is required to produce a safe stop. Since starters are typically provided inside the control panel, vendors will include the necessary safety rela Stop and the required interlocking with the motor starter

European (EN) S

European market njunction with ISO requirements. Th re designed to determine a categ presented with a machine or systen r slightly by defining the risk category. The nction of the stop required to employ The EN standards azard, frequency, and type, whereas NFP

The EN Standards a

- EN 945-1 Sa approximately 2011. The standard nd if more appropriate, E
- EN 13849 Saf a Control System
- EN 62061 Saf afety of Electrical, Electronics and Programmable Controls

As we shall see, a drive stopping circuit which is compliant with EN standards may not necessarily conform to NFPA 79®.

Occupational Safety and Health Administration (OSHA)

OSHA is an agency of the United States Department of Labor. It was signed into law on December 29, 1970. OSHA's mission is to "assure safe and healthful working conditions for working men and women by setting and enforcing standards..."

OSHA establishes the general standards which employers must meet. OSHA enforces National Standards, which are regulatory requirements. Many OSHA codes are written around employers using their own discretion and the adoption of voluntary standards in order to meet a safe working environment.