PE Statement of the Considerations

For the Risk Assessment

of the

Installation of a Tow Line Conveyor System
On an Assembly Line for Automobile Engines

as provided by

RSI, Inc.
1350 S. 15th Street
Louisville, KY 40215

I have reviewed the following documentation in general from RSI, Inc. concerning the Installation and Operation of its Tow Line Conveyor on an Automotive Engine Assembly Line:

1. RSI installation guidelines.
2. RSI manual.
3. Installation Guide Checklist.
4. Cart Assembly.

Also, I have been given particular information for capabilities that are not specified in the above listed generic documents. On a component basis, the following are my findings for this system:

A. Carts

Load capability. The cart design is job specific. RSI works with its customer to provide a mounting that results in the work piece c. g. to be optimally located in plan as near to the geometric center of the cart's 4 wheels. The front wheels are pivoting casters; the rear wheels are fixed casters. The height will be as near as possible to the customer has determined to be most ergonomically effective in assembling the line's engines. RSI has very impressive experiential data, having supplied such a cart to AM General for the assembly the very large automotive engines.

The horizontal force required on the bar across the front of the cart to lift the drive pin from the link in the tow chain is ~7 pounds. It generally takes about 40 to 50 pounds to initially move a fully loaded stationary cart.

B. Track

Trip hazard. An In-floor Towline Conveyor System imposes a miniscule tripping hazard. The maximum above floor projection is 1/32" by the slowly traveling vertical surface of a tow chain link. This can only occur through the most adverse accumulation of fabrication and installation tolerances.

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Chain strength. The breaking strength of the chain itself is 16,200 pounds. The more critical connecting link breaking strength is 11,200 pounds. For overhead lifting—which of course is not the application here but offers a good "what is adequate" value for a working load—the usually recommended Factor of Safety is 5 to 6 against breaking. So, the RSI tow chain has 1,860 pounds as its most restrictive working load for hoisting. A hoisted load represents the worst case catastrophe for chain breakage.

The tow chain of a Towline Conveyor System does not impose anywhere near the potential for catastrophe as that of a hoisted load. Nevertheless, RSI limits the tow force in the chain to 1,800 pounds, adding drives to lessen the tow chain loads. The primary force developed in the chain comes from friction as the chain turns corners. Secondarily, movement resistance comes from wheel friction imposed by each cart and the in-line chain drag. RSI has used years of experiential data to develop its algorithms determining the maximum tow force in the chain. RSI adds drives to keep the maximum tow force to the1800 pound towing limit.

Chain breakage from cart jams and/or foreign objects. RSI provides an amperage control on the motor. This control will shut off the drive motor should the preset amperage limit be exceeded. This limit is, and is meant to be, close to the normal amperage draw for the system. The whole concept of the system with each cart being individually towed, cascading forward when starting and stopping from a work station, effects a more or less steady amperage (amount of work) through the motor. Even a moderate rise in amps means that there is a problem within the system's operation. This feature serves to limit the build up of towing force in the chain to protect it from breakage from accidental overloads.

External, above floor devices. The close-pack section has devices above the floor to disengage the drive pin stopping the cart and then to release the pin for re-engagement, as well sensors to detect another cart. These devices, however, will always be covered by a cart, either stationary or in motion. Therefore, there is no trip hazard imposed during normal operation. All projecting devices are painted yellow for exposure during maintenance periods when carts may not be covering.

The void space within the in-floor track must only be used to contain the RSI chain.

C. *Drive station components.*

All drive components are located below the floor in the pit ring. There are detailed instructions within the IOM for installing and maintaining the gear boxes, reducers, tensioners, drive belts, drive motor, etc. None of these components are exposed during normal operation. Their service lines are via covered troughs and are, therefore, inaccessible as well. The installation of these components and their safeguards will all come under the requirements of local codes, rules, regulations, etc.

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D. *Control panel.*

The control panel provided is a Type 12, ANSI 61, for NFPA 70 rules. It has three-locks on the door as required. There are also terminals inside for wiring a separately mounted emergency stop if conditions at the Installation warrant. The wiring of such a stop obviously is to be by others.

In conclusion, this Statement of Considerations is not, nor should it be, taken as a complete risk assessment of this RSI Towline System. It is an inventory of issues common to a risk assessment. The site conditions greatly impact such an assessment, considerably more than just the equipment being provided. It is noteworthy indeed that RSI has over 800 installations involving such equipment. Experiential data is the best assessor.

I am a registered Professional Engineer in the State of Kentucky.

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