The standardized control of non-standard conveyor components

Presented by:
Tom Jensen GM, AMK Automation
Agenda

• What do conveyors systems look like right now
• What do we want them to look like
• How do we build and integrate them
• How far can I extend this
• Conclusions
Introduction

- **AMK** – Around since 1963; focused on machine automation
- **Tom Jensen** – A technology evangelist for 25+ years now leading AMK Automation in the US

**Worked in these industries:**
- Machine tool
- Packaging
- Auto Production
- Material Handling
Problem

In the years since the creation of industry standards like

> ISA 88 – Modular Code Structure
> PackML – Machine Control and OEE

• Why has the complexity of integration not changed?
• Why is data collection is still a goal and not reality?
Solution

- It wasn’t until recently that control platforms could actually provide a modular code approach to modular machines.
  - Economically
  - Programmatically
  - Conceptually
Concept

• The Idea – to have a box of “railroad track” that can snap together to make any conveyor cell
  – Modules with a given input and output
  – Modules with a single motor to move the module
  – Modules that are functionally identical (that doesn’t mean physically identical)
Concept

Modules that don’t fit this description – Ghosts

- Ghosts have –
  - Multiple axes
  - Complex Functions
  - Sophisticated Software

This is where the integration problem happens…
Concept

Modules that don’t fit this description – Ghosts

• All belts function the same, but the machines between don’t always play nice…
  – Different Builders
  – Different Functions

1 Same Process
2 Same Process
3 Same Process

Tricky OEE

Simple OEE
Concept - OEE

Overall Equipment Effectiveness
• Running speed / Design speed
• Running time / Available Time
• Output products / Delivered products

With 2 sensors at the entrance and exit of a process or machine, we can get complete OEE without digging into the OEMs machine code.
Concept

Machine Module
- Mechanical – the OEM’s mastery of the physical world
- Electrical – adding the muscle to the mechanical concept
- Software – tying the mechatronic solution together
Mechanical

• The Build

  - Straight Conveyor
  - Curved Conveyor
  - Diverter
  - Accumulating Conveyor
  - Right Angle Diverter
Electrical

- Concept – The standardization of hardware is key.

Decentralized Pros
  - Small
  - Less Cabling
  - Integrated local I/O
  - Servo or Eq Drive
Software

• Goals
  – No programming environment
    • Configure from HMI
    • Configure from spreadsheet
  – Have the local control auto configure
  – Account for all layout objects
Software

What’s in the box?

• Controller
• +24VDC
• Motor Power
• STO
• Multiple Communication protocols
Software

What does the PLC code look like? Who cares!

- Code that auto configures for discovered modules
  - Always 1 motor
  - Always 2 sensors
- Code that can take in a CSV or similar
- Code that can talk to a higher system
With a spreadsheet, the entire cell can be configured, saved as a CSV file and dropped into the conveyor cell control.

A list of available modules identified by the conveyor control

What Action you want the module to do

Saved as a CSV, and put into the controller

From a predefined drop down list
What does it look like…

We have;
• Visibility to the floor
• OEE for all modules including legacy
• Ownable by plant personnel
• Small footprint
Extend the Concept

• Is there any difference to the definition for a conveyor module or a cell?
  – Functionally Identical
  – Inputs and Outputs
What does it look like...

We have;
• One Input
• One Output
• Working with other like modules
What does it look like...

A Master control can be added using the same exact programming scheme because the cells themselves have;
One “motion”
Two “sensors”

Cell “modules” can also be programmed with a spreadsheet...

OPC, EiP or any other industrial network
Results

1. Lower Inventory across all disciplines
   - Standard modules means standard components
   - Design from the catalog

2. Normalized OEE across the line

3. Plant personnel own the solution
   - If they can use a spreadsheet
Cautions

• The concept allows the standardization and integration of like modules, and data collection based on modules.
• Your operations may need more comprehensive package routing. If so, the data collection scheme becomes the operations check on performance.
• Modules can be added for rework points (rejects, bad products) as part of OEE.
For More Information:

Speaker email: tom.jensen@amk-group.com
Website: www.amk-group.com

and visit us at booth B1163