

Basic Methods of Length Control

Metalcon 2012

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AMS Controls



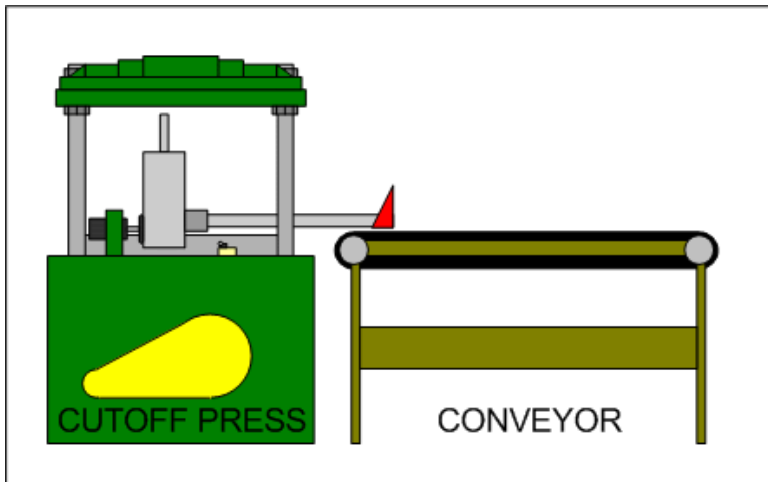
Why are we here?

- Explain the main types of length control systems typically used in the metal construction industry
- Help decide which system is best for your needs
- Get the most out of your existing equipment

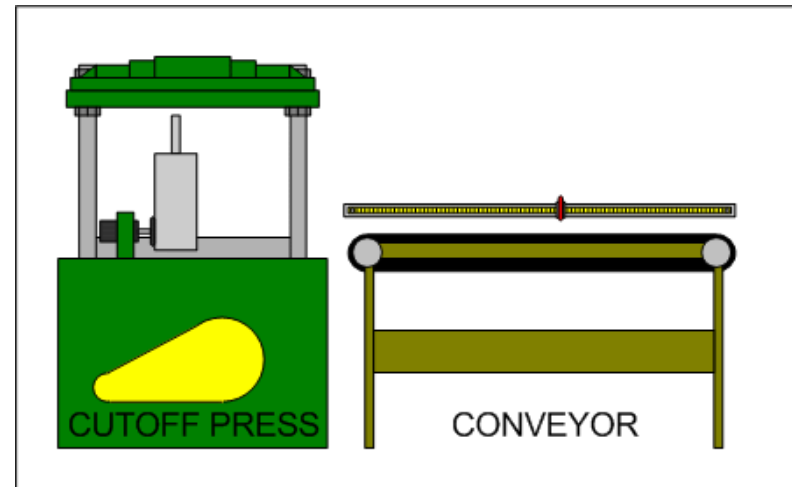


Mechanical Length Control

Gauge Bar Length Control



Flag Switch Length Control

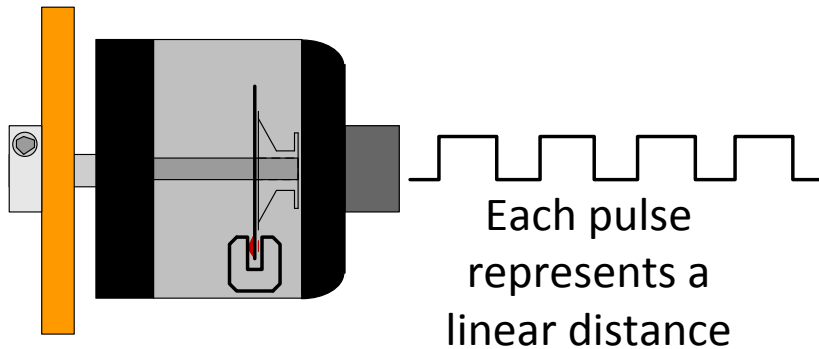


Consistent lengths, but...

- Limited speed, die weight & part length
- Length changes mean delays & scrap
- Not well suited for other in-line operations

Electronic Length Control

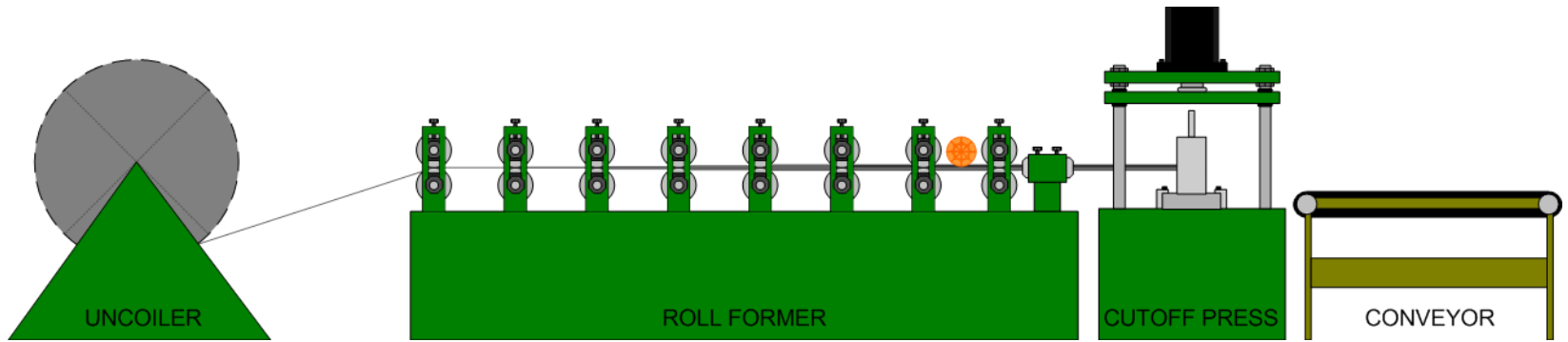
- Electronic length control relies on an encoder to “see” material move through the machine.
- None of the limitations of mechanical control
- Possible to achieve as good if not better repeatability



Four Basic Application Types

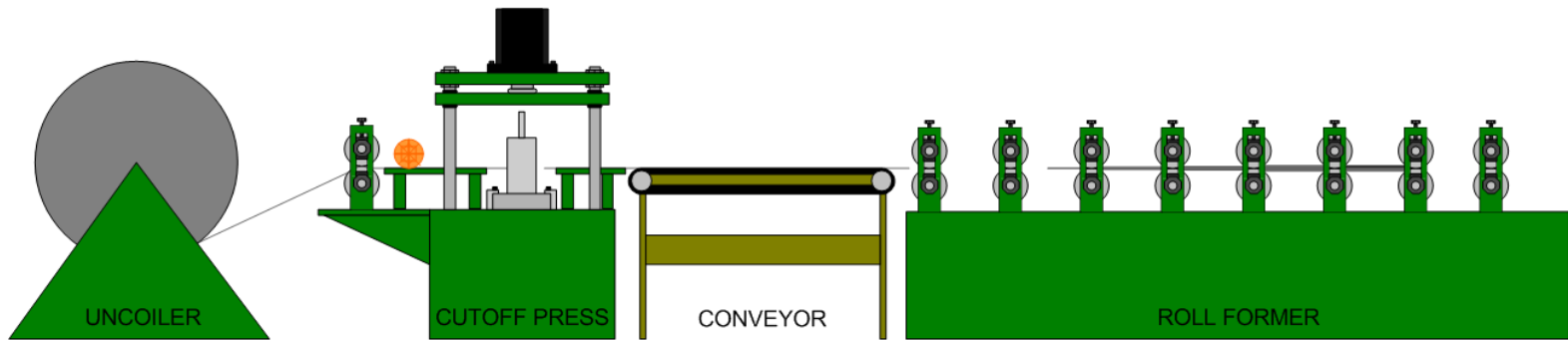
- Stopping or Flying
 - Stopping: material stops for each operation; presses are in fixed locations
 - Flying: material moves continuously; presses/dies on slides and must match speed
- Open or closed loop
 - Closed loop systems use feedback information to make constant adjustments to speed or position.
 - Open loop systems rely on information known before the action is started, but cannot make mid-course corrections

Open Loop Feed-to-Stop



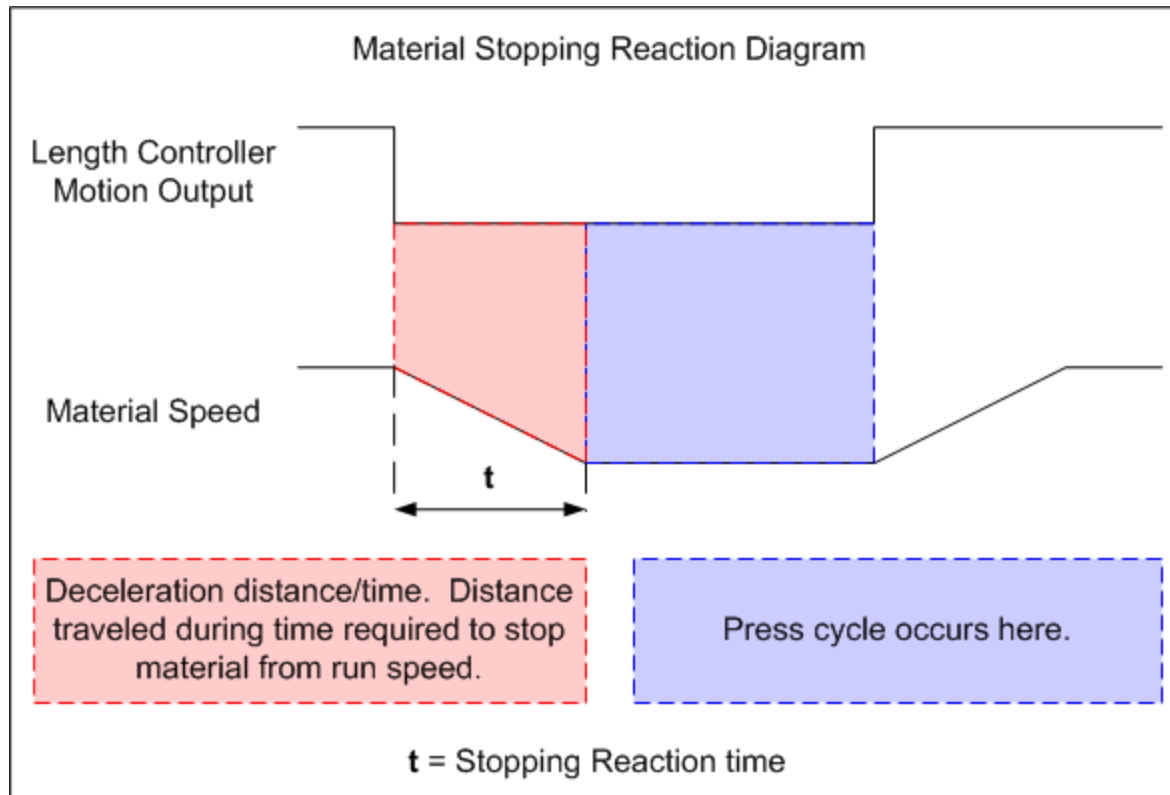
Open Loop Feed-to-Stop Post Cut Line

Open Loop Feed-to-Stop

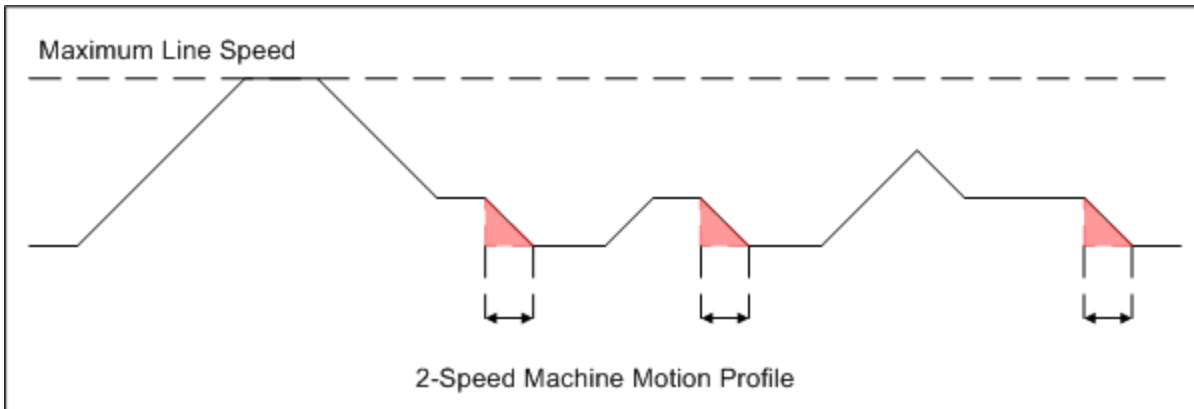
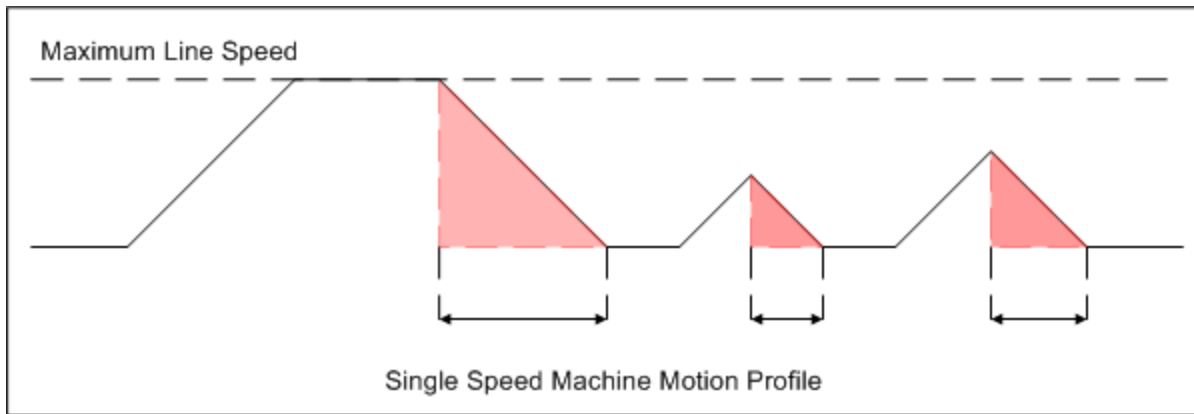


Open Loop Feed-to-Stop Pre-Cut Line

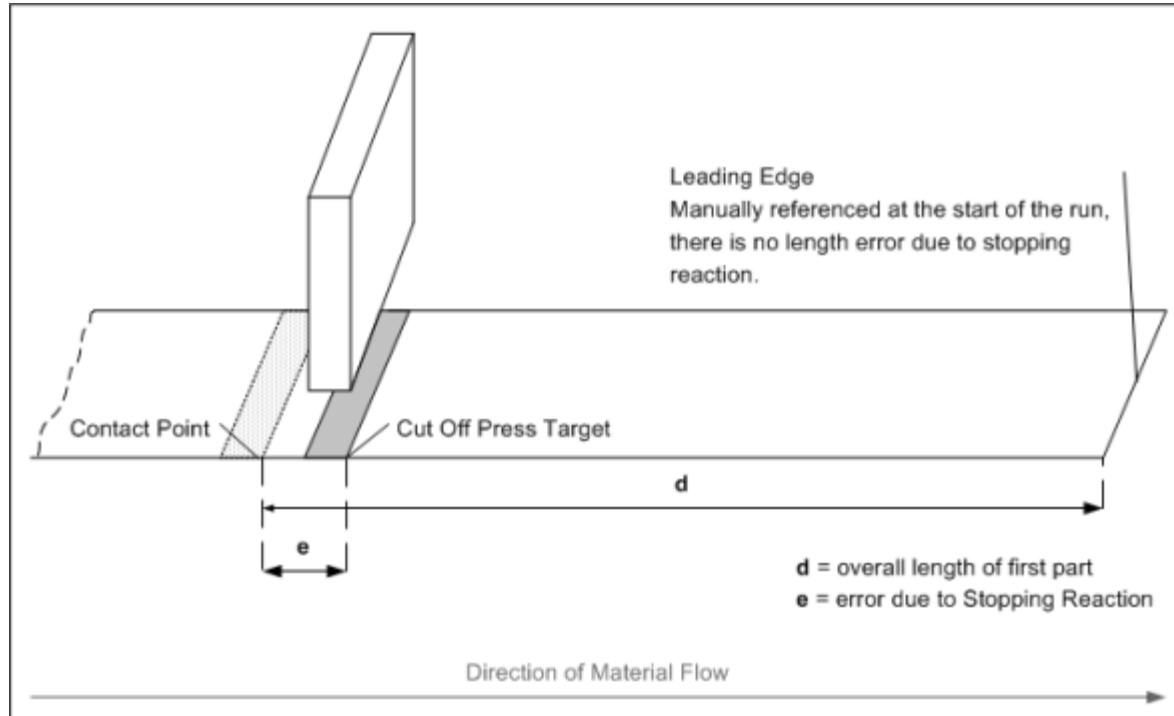
Open Loop Feed-to-Stop



Open Loop Feed-to-Stop



Open Loop Feed-to-Stop



Open Loop Feed-to-Stop

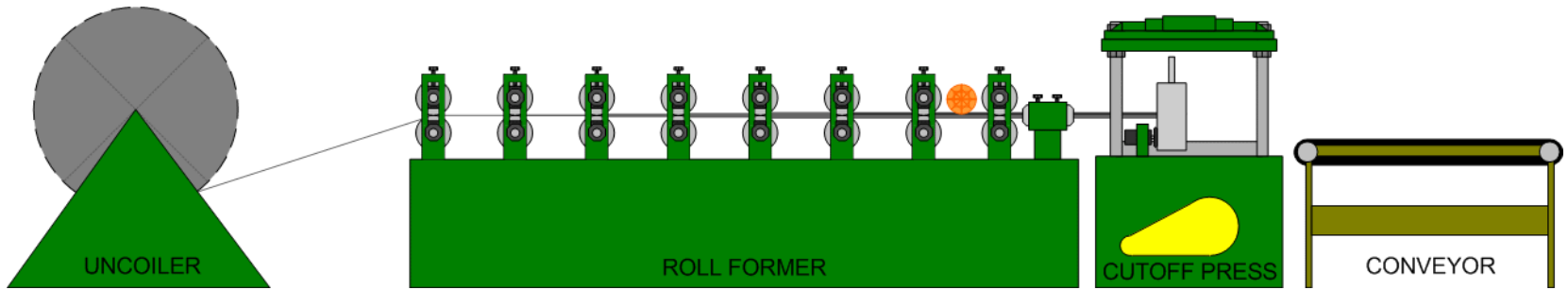
- **Uncompensated Systems**
 - Produces a Long Part on Startup
 - Sensitive to Speed Changes
 - Sensitive to Environmental Changes
 - Sensitive to Material Changes
- **Compensated Systems**
 - Part Lengths More Accurate from First to Last
 - Compensates for Shifts in Machine Timing
 - Lower Throughput When Compensating for Machine Timing Changes
 - Parameters Must be Set Properly

Open Loop Feed-to-Stop

- **Key Points**

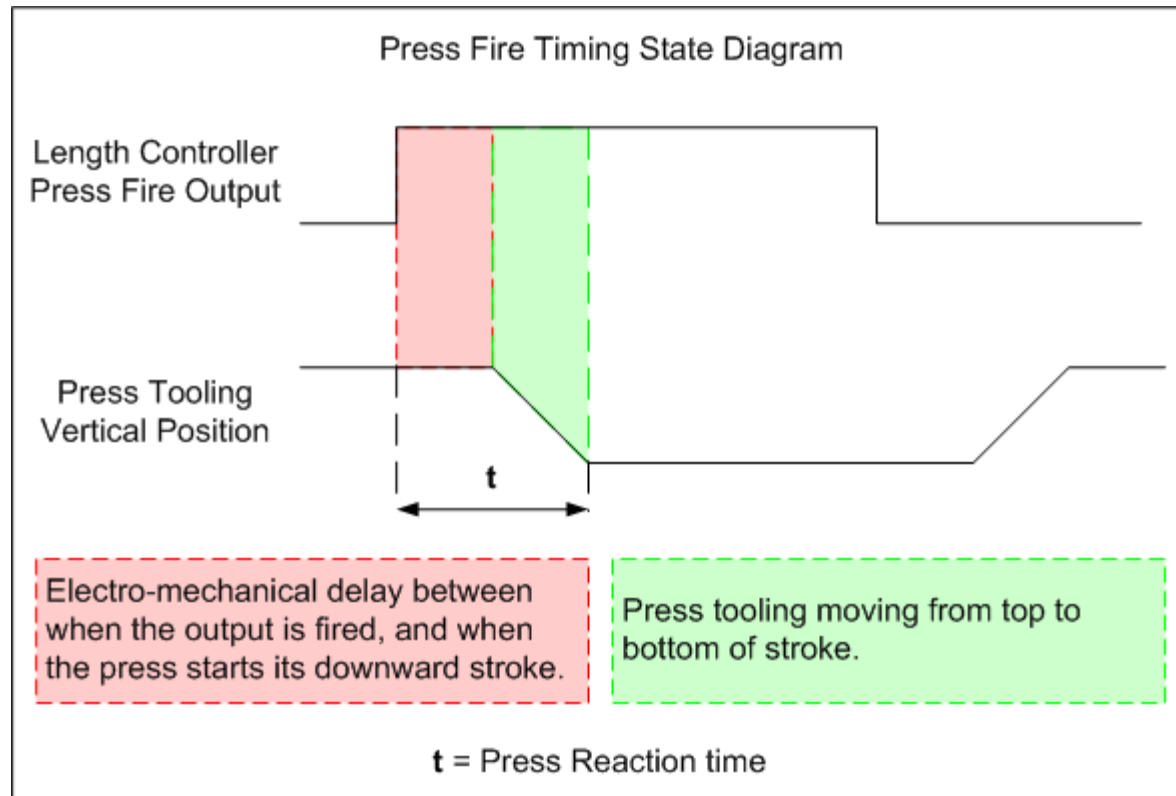
- Low Cost
- Low Throughput
- Moderate Accuracy $\pm 0.032''$ (0.8 mm) or better
- Sensitive to Timing / Tracking Variations
- Press Variations Do Not Affect Length
- Typical metal construction applications:
 - Roofing panels
 - CTL / slitting
 - Metal studs

Open Loop Flying Die

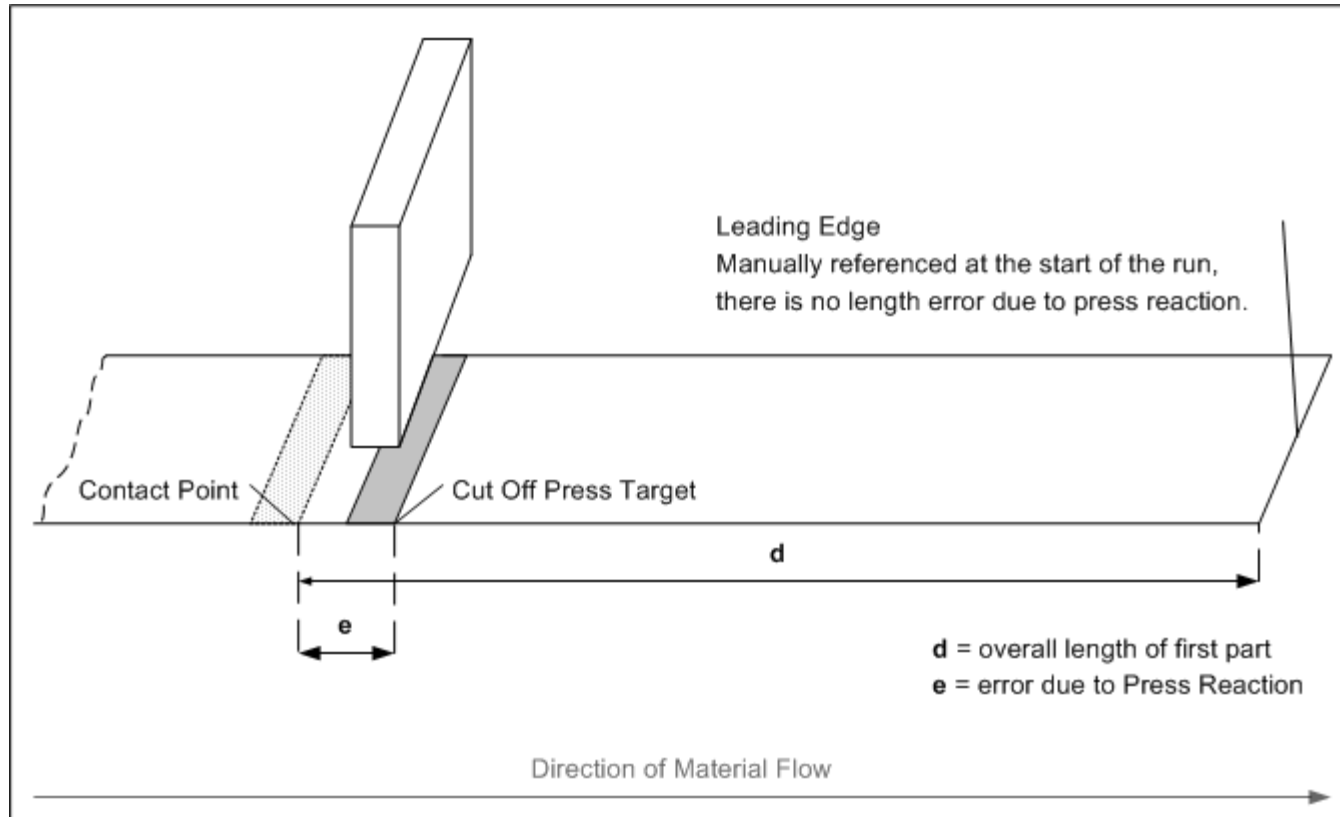


Open Loop Flying Die Post Cut Line

Open Loop Flying Die



Open Loop Flying Die

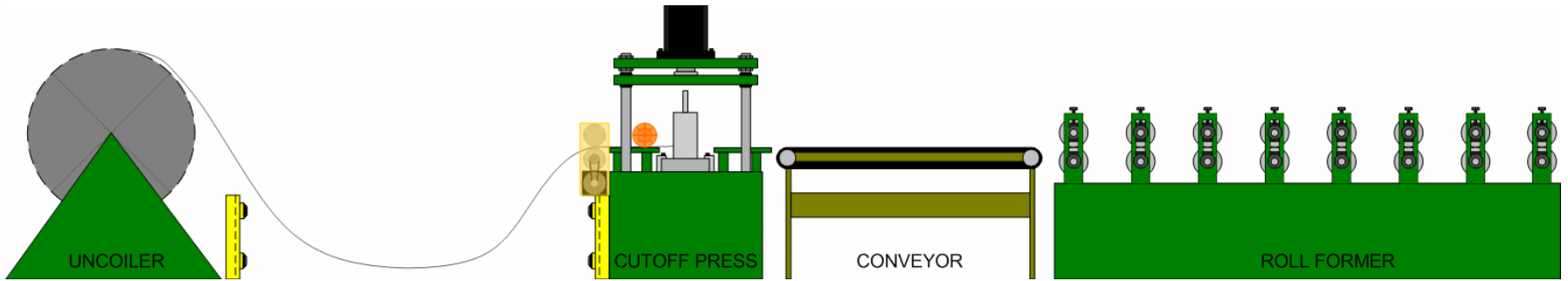


Open Loop Flying Die

- **Key Features**

- High Cycle Rates / High Line Speeds (4+ hits per second)
- Low Cost
- Moderate Accuracy
- Boost system needed for higher speeds or heavier presses
- Higher Accuracies Require Regular Maintenance
- Sensitive to Timing
- Typical metal construction applications:
 - Metal studs
 - Roofing panels

Closed Loop Feed-to-Stop

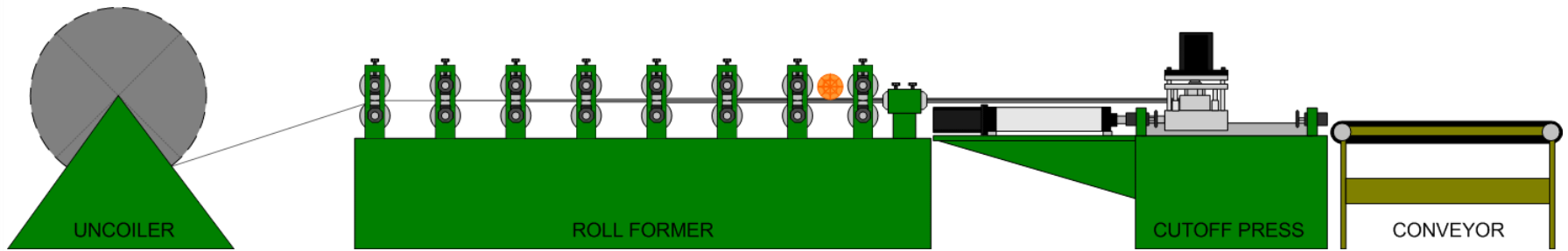


Closed Loop Feed-to-Stop Pre-cut Line

Closed Loop Feed-to-Stop

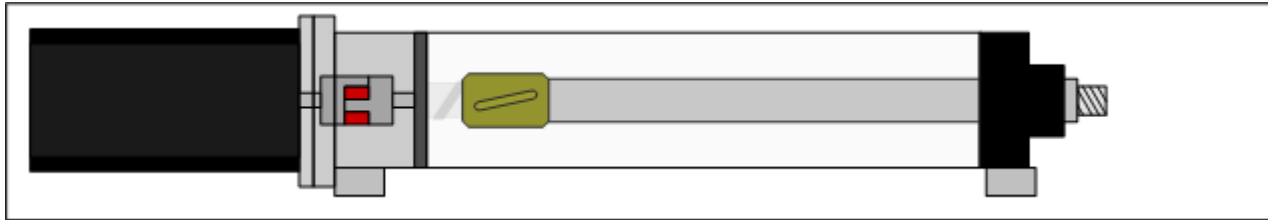
- **Closed Loop Feed-to-Stop Key Features**
 - Very High Accuracy ($\pm 0.003''$ (0.08 mm) or better)
 - Higher Cost (Servo System and Associated Components)
 - Gagged Dies Allow for Extremely Flexible Punching Operations
 - Material encoder can compensate for feed roll slip
 - Supports Continuous Press Operations
 - Typical metal construction applications:
 - Purlins
 - Cut to length lines

Closed Loop Flying Die



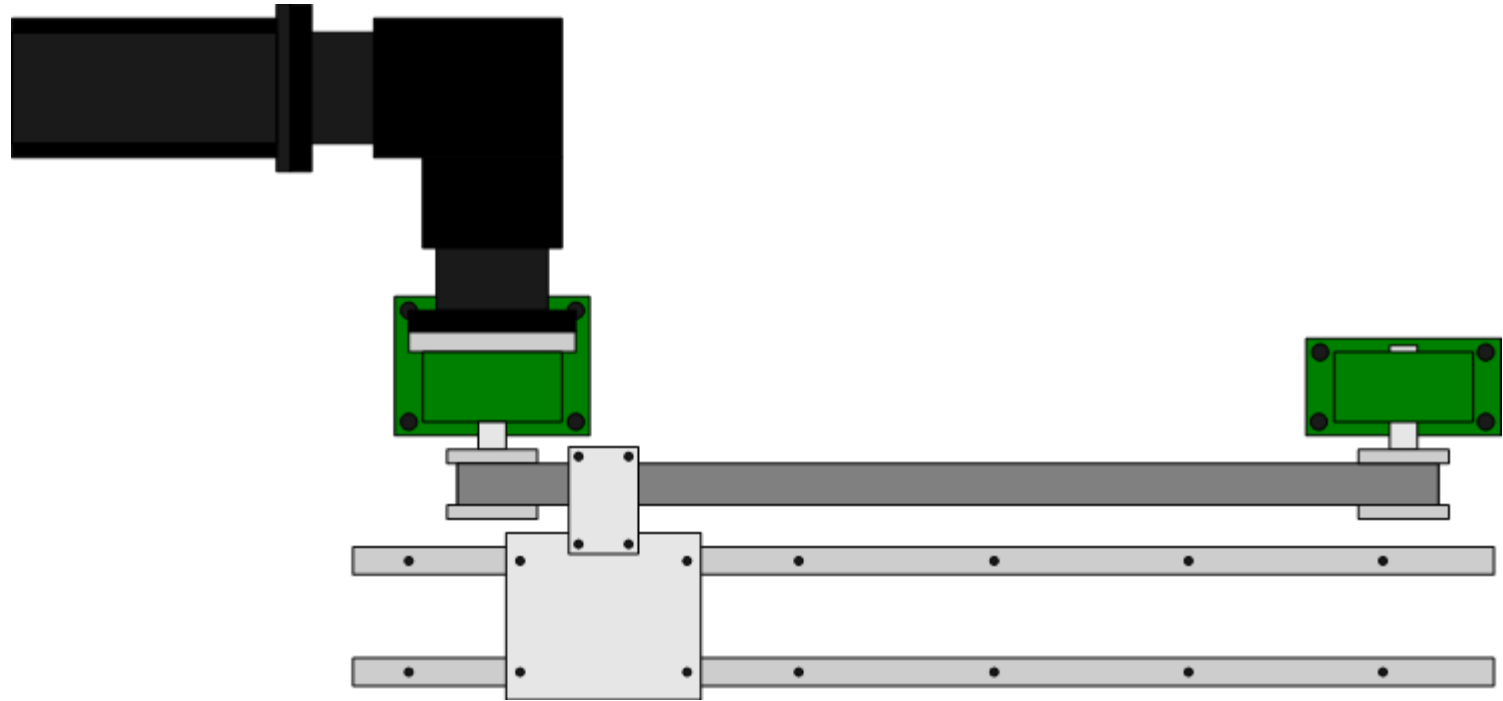
Closed Loop Flying Die Post Cut Line

Closed Loop Flying Die



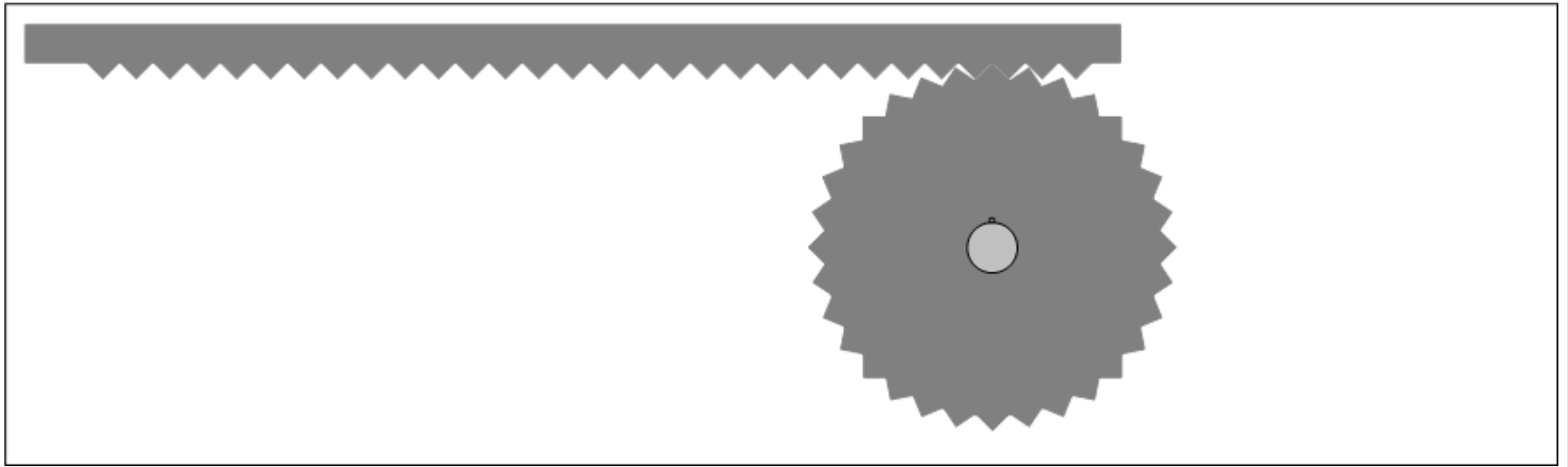
Servo Motor and Ballscrew Actuator

Closed Loop Flying Die



Belt Driven Actuation System

Closed Loop Flying Die



Rack & Pinion Actuation System

Closed Loop Flying Die

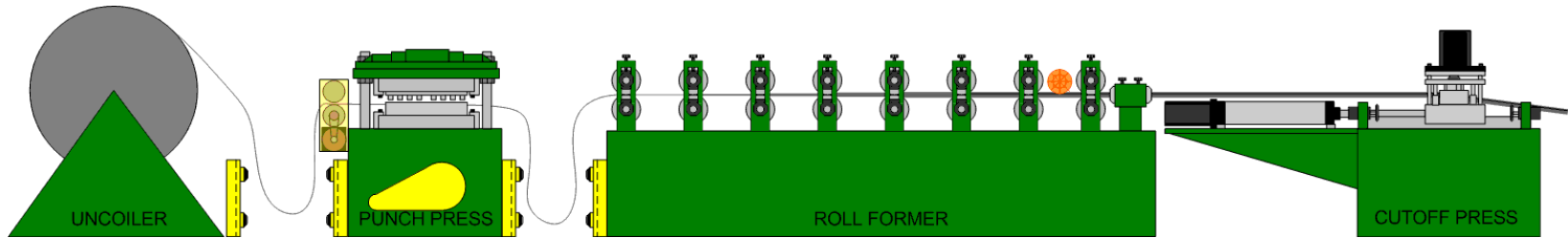
- **Rotary systems:**
 - **Pure rotary press**
 - **Crank press**
 - **Eccentric press**

Closed Loop Flying Die

- **Closed Loop Flying Die Key Points**

- High Accuracy
- High Throughput
- High Cost
- Not Sensitive to Timing Variations of Equipment
- Sensitive to Encoder Tracking Variations
- Requires Higher Expertise for Startup and Troubleshooting
- Typical metal construction applications:
 - Metal studs
 - Roofing panels

Combination Example



Closed loop pre-punch + hole detect + closed loop flying shear

- Pre-punch Systems Should Include Gagged Tool Specifically Used for Hole Detect
- Hole Detect Systems Require Careful Placement of Photo-Eye
 - Coolant
 - Material Control
 - Hole Shape
 - Speed

Summary

- **Key Points**

- There are 4 basic types of length control – most roll forming machines use one or a combination of these
- Selecting the best choice is a balance between
 - Throughput
 - Accuracy
 - Cost