Sensor Applications for Die Protection

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Part of our “Manufacture Smarter” series
What is Die Protection?

- A die protection system monitors material movement and critical events in the stamping process.
- The goal of die protection is to stop the press before it makes a bad hit.
How Does it Work?

• Sensors are installed in and around the die

• The sensors monitor specific events, signaling a controller when events occur

• When the system detects a problem, it will open a stop relay to stop the press
A proximity sensor is a sensor that can detect, without actual physical contact, the presence of a metallic object.
Proximity Sensor Operation

When power is applied to a prox, an invisible sensing field extends from the face of the sensor.

The sensor actuates when a metal object touches the sensing field.

The target does not have to block the sensing field, it only needs touch to touch the edge.
Proximity Sensor Packages

Tubular, both threaded and unthreaded barrel

Low-profile flat package
Prox Sensor Detecting a Pilot Hole

Sensing field

Strip
Prox Sensor Detecting a Pilot Hole
Prox Sensor Detecting a Pilot Hole
Prox Sensor Detecting a Pilot Hole
Spring Loaded Proximity Sensor
Proximity Sensor at the End of the Die

Strip too high, misses sensing field

Strip too low, misses sensing field
Sensor with Spring Loaded Plunger

Feed

Sensing Field

Spring

Plunger

Case

Sensor
Misfeed Sensing

- 8 mm Prox Sensor
- Plunger
- Spring
Misfeed Sensing

Overfeed is detected
Misfeed Sensing

Shortfeed is detected
Misfeed Sensing
Misfeed Sensing

Move the sensor closer to the plunger for more precise detection
Misfeed Sensing

Back it off for looser feed tolerances
Through-Beam Photosensor

Also called opposed-mode photosensor

Light beam from emitter shines directly at receiver

Long range (up to 700’) - Very high excess gain

Can be made very precise by using apertures.
Through-Beam Photosensor

Target must block half of sensing beam to actuate sensor
Through-Beam Photosensor

Potential Problems

Target is too small to actuate sensor (does not block half of beam)

Object reflects the emitter beam at the receiver. Even though target blocks more than 1/2 of beam, it is not detected
Through-Beam Sensor with Aperture

No aperture -
Wide effective beam

Aperture
(also called a "slit plate")

Aperture installed -
Narrow, more precise effective beam
Through-Beam Feed Sensor
**Photoelectric "Fork" Sensor**

- For misfeed detection applications where sensor can be placed at the end of the die.

- Can be easily retrofit into existing dies.

- Usually used to detect the edge of material (dark-on operation).

- Sensor has built-in apertures.

- Extremely repeatable (as low as $\pm 0.0002\)".).
Photoelectric "Fork" Sensor

Emitter

Sensing Beam

Receiver

Emitter

Receiver
Sensors for Part Ejection

Mini-Light Curtain

Diffuse Reflective Sensor

Impact Sensor

Proximity Coil
Mini-Light Curtain

Part breaks the light beam to actuate the sensor

Available with either visible or infrared light

Can be speed sensitive

Usually mounted outside the tool
Diffuse Reflective Sensor

Receiver needs to see only a very small amount of light from the emitter for the sensor to actuate.

This allows the sensor to detect small, even non-reflective objects.

This sensor is also prone to false actuations caused by objects in the background.

These sensors must be installed so that the point off “into space” so that false actuations can be avoided.
Diffuse Reflective Sensor
Diffuse Sensor “Screen”

Sensing Area

Diffuse Reflective Sensors
Material Buckle Detection
Stripper Position Monitoring

Stripper Plate

Sensor

14 mm Low Profile Proximity Sensor
Stripper Position Monitoring

Slug on top of strip, sensor does not turn on at BDC
Detecting Slug Stacking

Through-Beam Photosensor

Apertures should be installed on the sensor.
Detecting Slug Stacking

Without apertures, the sensor “floods” the area with light. Parts do not block enough of beam to reliably actuate sensor.
Detecting Slug Stacking

Proximity Coil
Sensor
End of Stock Detection
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