ITT

Cleveland Motion Controls

Web Tension - FAQ (Frequently Asked Questions)

Q: What is meant by web tension control?

Web Tension Control refers to the control of the tension in a moving web or strand of material. Typically there are various sections on the machine referred to as tension zones that require control of the material tension. Depending on the application, different zones may require different tensions in order to produce a quality product.

Q: Why is it necessary to control the tension in the web?

Proper Tension Control in the web results in a higher quality product, and more throughput. For instance, if the tension is not properly controlled, wrinkles in the material can occur which result in defective product.

If the roll of material is rewound incorrectly, the outer layers can crush the inner layers of material, or the rolls can telescope, resulting in damage when the rolls are handled. When printing on material, improper tension control results in smearing of the ink and fuzzy images due to poor registration. Some materials loose their elasticity if they are stretched as a result of poor tension control. Good tension control also results in the capability to run the process at higher speeds without sacrificing product quality.

Q: What are some of the processes requiring tension control?

Examples of Processes that use Web Tension Control include:

- Printing
- Coating
- Laminating
- Slitting
- Winding
- Cable and Wire Manufacturing
- Textile Manufacturing

These are traditional applications requiring tension control. However, any process that involves converting, extruding, or moving a web or strand of material requires some form of tension control.

Q: How is tension controlled?

Generally the web is pulled off a large roll of the material, processed, and rewound. So, tension zones are referred to as the unwind, intermediate, and rewind zones. There are various ways of controlling the tensions in these zones. Some are more sophisticated than others. Following are various methods of controlling the tension of the material on an unwind stand from the most basic to the most sophisticated:

- Manually changing the tension on the drag belt on the unwind stand.

- Manually changing the torque of a brake on an unwind stand.

- Automatically reducing the torque on the brake of an unwind stand as the diameter of the roll decreases. Diameter is measured via a mechanical rider arm or diameter sensor and the torque is reduced proportionally as the diameter decreases.

- Automatically controlling the speed of a motor on an unwind stand in order to keep a dancer mechanism at its center or equilibrium position.

- Automatically controlling the torque on a brake or speed of a motor on the unwind stand by actually measuring the tension with a tension transducer (load cell) and using a closed loop controller to control tension to a precise value.

- Using a Tension Transducer (Load Cell) to measure and control tension is the preferred method since it offers precise control. CMC specializes in Tension Control that utilizes tension transducers.

Q: What exactly is a load cell or tension transducer, and how does it measure the tension in a web?

The term load cell and tension transducer are used interchangeably to describe a sensor that measures the tension in the web.

The term load cell is commonly used to describe weigh scale sensors that precisely measure the force or load due to the weight of an object. The term has carried over to the web handling industry since the sensor measures force due to tension in the web. The term transducer is defined as a device that transforms one type of energy to another. The sensor measures a force that is the result of tension in the web and transforms it into an electrical signal.

The primary measuring elements (in most tension transducers) are strain gages. The strain gages are attached to a mechanical structure within the transducer that bends or deflects when a tension force is applied. This bending creates a strain or elongation of the molecules within the structure. The gage measures this strain and generates an electrical signal that is exactly proportional to the amount of force applied.

APPLICATION/PRODUCT SPECIFIC QUESTIONS

Q: How can CMC help in solving my web tension problems?

CMC has over 40 years of experience providing web tension solutions. We were first with an industry proven load cell (tension transducer) with our Cleveland- Kidder® brand; and we continue to improve the performance of our load cell designs. Our expertise is two-fold: in the application of our load cells and then integrating them into a complete closed- loop control package. CMC manufactures stand alone Closed-loop Controllers (WebPro Digital Tension Controllers), Tension Indicators, and Devices that integrate with programmable controllers and other process controllers (such as our DIN-Rail CE amplifier).

Q: How do I go about selecting a CMC tension transducer (load cell) for my application?

CMC manufactures various styles of Tension Load Cells for various configurations.

First, determine if you have a wide web or a narrow web, or a wire application. A wide web requires two load cells, one on each end of the tension roller. Then determine if your tension roller shaft is fixed or if it rotates. CMC has wide web transducer designs for both fixed (dead) and rotating shafts. For narrow web and wire applications, only a single load cell is required, and it accepts either a cantilevered roller or a sheave. If you are unsure of the style of load cell required please contact CMC for assistance.

Then, complete the information on the Load Cell Sizing Data Sheet for the transducer that you selected and forward it to CMC. CMC's application engineering staff will select the proper load rating (referred to as MWF or maximum working force) for

the style of load cell you selected.

Q: How do I determine the electronics (amplifier, indicator or controller) that I need?

The electronics that you select depends on your application requirements. As a minimum, you'll require a Load Cell Amplifier to power the Tension Transducer and to provide a signal that is sent to another device. CMC's DIN-Rail CE amplifier is used to integrate with programmable tension controls and other process controllers. It transmits a 0-10VDC or 4-20 ma signal to those devices. CMC's Tensimaster Tension Indicators are used to display the tension value. Our WebPro Advanced Digital Tension Controls are standalone controllers that provide complete closed-loop control. The operator sets the required tension and the WebPro compares the actual tension measured by the load cells to the tension set-point. It then controls the output to a brake or motor drive providing total closed-loop tension control.

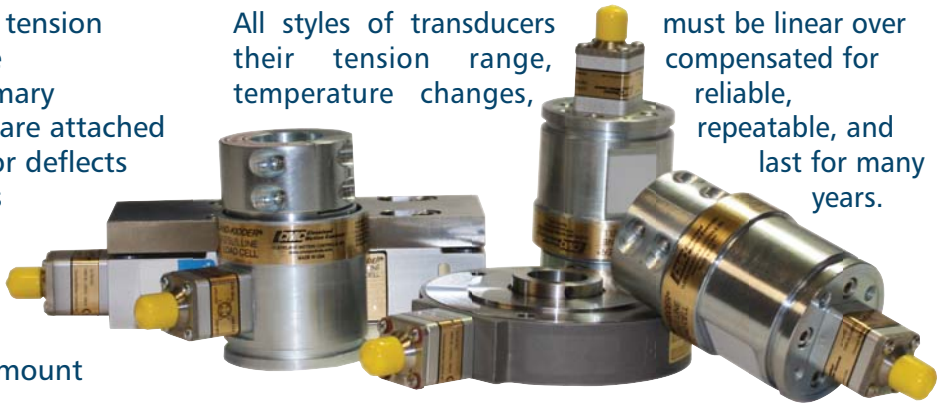
Q: Why should I select CMC tension transducers instead of other brands?

CMC tension transducers incorporate features that provide superior performance for web tension measurement. CMC Transducers utilize semiconductor strain gages as the primary measuring elements. The strain gages are attached to a mechanical structure that bends or deflects when the tension force is applied. This bending creates a strain or elongation of the molecules within the structure. The gage measures this strain and generates an electrical signal that is exactly proportional to amount of force applied.

A primary consideration in tension sensing is that the path of the moving web be disrupted as little as possible as the measurement is being taken. This means that the deflection of the transducer must be minimal. The more deflection, the more likely the web path will be disturbed and not track properly. CMC transducers exhibit very little deflection at the rated tension load, typically only between .002 to .004 inches. In addition, our twin beam design insures that any beam deflection is perpendicular to the web path to prevent steering the web to one side. Brands from some manufacturers typically allow as much as .01 to .10 inches deflection at full load.

The signal output of the transducer must be large enough for the transducer to operate over a large tension range (typically 20/1 to 30/1). CMC utilizes semiconductor strain gages that have a very high gage factor (100) and provide high signal output at small deflections. CMC transducers typically provide a 100MV to 250 MV output at rated load. Transducers from some manufacturers provide as little as 21MV at rated load.
The transducer must respond quickly to tension changes. CMC transducers are designed to have a high natural frequency; they respond quickly to changing tension in the web. CMC electronics such as Load Cell Amplifiers, Tension Indicators, and Tension Controls are also designed to accommodate this rapid response. Brands from CMC has a wide breadth of product offering. We offer configurations for wide web, narrow web and wire, fixed shafts, and rotating shafts. Load cells are offered for corrosive and washdown environments, intrinsically safe applications, and high overloads. Select from our Cartridge Style Transducers, Slim Cell, Washdown Duty UPB, and CLT for the load cell that is just right for your requirements.

All styles of transducers must be linear over their tension range, compensated for temperature changes, reliable, repeatable, and last for many years.



All CMC transducers are designed to meet these high standards. CMC has been manufacturing tension transducers for over 40 years. Our longevity and the outstanding reputation of our Cleveland-Kidder® brand attests to the superiority of our product.

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