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THEORY OF OPERATION

General

A Fife electrohydraulic guiding system is a closed-loop servo control system used to maintain the web at the desired lateral position on a process line. The components of the system include a sensor (or sensors), a Model A9H Signal Processor, an electrohydraulic power unit, and a guide structure which is driven by a hydraulic actuator. See Figure Sheet 1-510. The guide can be a Kamberoller, a Kantiroller, one of Fife's patented linear race guides, an unwind stand, or a rewind stand.

Components

The infrared sensor (or sensors) contains light-emitting diodes (LED's) that emit invisible infrared light. This light travels across the gap of the sensor to a solar cell. The current conducted by the solar cell depends on the amount of light striking the cell. The amount of light from the LED's available to strike the cell is governed by the lateral position of the web in the sensor. If the web moves into the sensor, less light strikes the cell. Therefore, as the web moves laterally in the sensor, the current being conducted by the cell varies due to the change in light. With the web at a certain point (guide point), the current is stable at a definite value (null point).

A line guide sensor is a line/edge guide sensor which emits visible light from a high-quality incandescent lamp. In the line guiding mode, the light is focused into a sharp oval pattern that is bisected (split by the edge of the web or edge of the line). The light reflected from the web is focused on two closely spaced photodiodes. The two photodiodes each generate a current. The sensor converts the currents generated by the photodiodes into voltages for use by the signal processor. The signal processor compares the signals from the photodiodes and outputs a current to the hydraulic power unit to correct the lateral movement of the web. In the

line guiding mode, when the voltages input to the signal processor are equal, no output is required by the signal processor. In the edge guiding mode, the voltages input to the signal processor are added together and, when there is no change in this sum, no output is required by the signal processor.

The sonic sensor is an ultrasonic edge guide sensor operating at a 40-KHz frequency. The sonic sensor detects the web in the same manner as the infrared sensor, except the web is sensed by an ultrasonic wave instead of the infrared light.

The signal processor detects any difference between the voltage due to the actual web position and the voltage at the null point. If there is a difference, the signal processor outputs a current to the servo valve on the power unit. The power unit outputs a hydraulic flow to the hydraulic cylinder which causes the guide structure to move, bringing the web back to the guide point. The correction speed is proportional to the amount of web position error detected. The guide moves only if the web wanders from the guide point.

The guide point and optional remote guide point adjustment controls can be used to electronically vary the point at which the system guides the web. The Operating Instructions section of this manual discusses the function of these controls.

The optional Servo-Center device is used to lock the guide in a centered position, that is, with the rolls on the guide parallel to the other rolls in the process line. This feature is useful during web threading operations. When the system is in the Servo-Center mode of operation, it does not respond to signals from the sensors.