

# LOAD CONTROL INCREASES EFFICIENCY OF GRINDERS

The COMPENSATOR power sensing load control is being widely used by both grinding machine builders and by users of grinders. Ball and roller bearing makers, for example, use the COMPENSATOR to speed up grinding cycles. In one case, the total cycle time was cut in half!

It is being used to upgrade older machines that are being automated and to replace other type of load controls or grinding wheel position sensors that don't work reliably and repeatedly.

## GAP ELIMINATION

For an automatic grinding cycle, it is desirable to quickly bring the grinding wheel into contact with the workpiece without "grinding air". Since the size of the grinding wheel is always changing, it's hard to predict exactly where the wheel is. The solution is to monitor the spindle power as the wheel advances toward the workpiece. An increase in power means that the wheel has touched. A great advantage of doing this is that the sensor is not located in the work area. To make this work reliably in practice requires 3 important elements:

- Eliminate the need for adjustment
- High sensitivity
- Fast response

## COMPENSATED SET POINT (ADJUSTMENT FREE)

The gap eliminator set point needs to be very close to the idle power of the grinder. Unfortunately, the idle or "Baseline" power of a grinder drifts because of changes in:

- Motor winding temperature
- Lubricant viscosity
- Mechanical clearance
- Idle speed

For accurate operation, this drift must be zeroed out.

A limit switch or programmable controller signal tells the COMPENSATOR each time the machine is in the idle or "Baseline" position. The COMPENSATOR samples this power level and retains it as a reference. The gap eliminator set point is related to this Baseline.

In other words, the COMPENSATOR zeroes out the Baseline power for each cycle. The absolute trip point changes as conditions change but always remains a fixed amount away from the Baseline. This means no constant fine tuning. It adjusts itself.

The Baseline drift can be significant. In one case there was a 17% change during a morning shift. Without compensation, the wheel would really have to smack the part to get a trip. This is not good for machine, workpiece or operator's nerves.

## SENSITIVITY

By measuring motor power rather than just motor amps, the sensitivity is greatly increased. For a lightly loaded motor, there is a 10X improvement in sensitivity.

## FAST RESPONSE

With a special filtering system the response time of the COMPENSATOR is reduced to less than 35 milliseconds including the relay response time. This compares with 250-500 milliseconds for a typical power transducer.

## GROSS OVERLOAD

A second set point is used to limit the total load on the grinders. This set point is NOT compensated so regardless of how the upper set point is reached, the control will trip. A compensated set point will not catch bearings going bad or a jam-up when the wheel is retracted. A compensated set point would learn these values as normal.

## ANALOG OUTPUT AND SET READ SWITCHES

The analog output on the control is proportional to motor power (horsepower or kilowatts). In all cases, the output is hooked to a load meter that the operator can watch. This gives him valuable information:

- Optimum feed rates
- Wheels that are loading up and need dressing
- Changes in the hardness of the workpiece
- Reduced load as the cycle is finished

There are Set Read switches for each set point. When these switches are pressed, the Load Meter will show where the set points are. This greatly simplifies set-up and adjustment.

The analog output can also be hooked to a chart recorder. This is of great value when:

- Developing optimum grinding cycles
- Evaluating grinding wheel performance.

## THE COMPENSATOR CONTROL

The control that is used on grinders is the PCR-1810. It has these features:

- **One Compensated Set Point** — for Gap Elimination. The relay output for this set point is hooked into the machine logic to change the infeed rate as soon as it trips.
- **One Standard (Not compensated) Set Point** — for Gross Overload. The relay output for this set point is hooked into the machine emergency stop circuit.
- **A Built-in Start-up Timer** — to bypass the control during the inrush as the motor starts.
- **An On-Delay Timer on the Overload Set Point** — to filter out nuisance trips. The control won't trip until this delay time is exceeded. The On-Delay Timer for the Gap Eliminator Set Point is deleted from the control so that the response time can be as short as possible.

