Paper Slitter-Rewinder Edge Control Retrofit

A relocated paper web processing machine requires previously unused edge position control sub-system redesign and deployment to production. This series covers system evaluation, control scheme prototyping, and production form factor system completion to production go-live.

Design Task

A paper slitter-rewinder purchased from one factory and relocated to another arrived at the new site with a set of sensors and partial PLC code for the purpose of web-edge position control. Often in paper web handling output edge uniformity on the finished roll is guaranteed by an "edge trim" that presents a clean and uniform edge on the side face of the output roll as shown below.

Goal is output side face like this (some hundredths toleranece). This is slit-edge output (ideal).

Some applications do not permit an edge trim and must regulate the input roll lateral position to maintain a degree of uniformity on the output roll face. For example, when slitting one roll into two with a single cutter in the middle with no cutters trimming a small waste strip on each side.

With no edge trim the open-loop performance of the machine will drift the edge slightly as load conditions change with increasing mass on the output roll relative to the depleting input roll. Feeding-back edge position to an input rack hydraulic servo drive compensates for this open-loop drift.

Performance Target and Project Approach

The goal is to achieve the best-possible output edge control given existing components if possible. Tens-of-thousands of an inch uniformity over the output roll face based on visual assessment of rolls from other machines deemed satisfactory from operator experience.

- Project Approach
    - Enable resident control scheme and tune/modify. If not sufficient,
    - Characterize the plant.
    - Redesign control scheme within existing PLC or,
    - Design new edge control sub-system atop existing sensors and drives.

The last option became the solution following characterization and a decision to not deal with equipment and legacy expertise challenges associated with using the resident PLC.

Next: System Configuration