MULTIPLE PAPER ROLLS on COMMON INVERTER

Criteria

MULTIPLE PAPER ROLLS on COMMON INVERTER

General

Many web processing systems incorporate large numbers of paper carrying rolls (Paper Rolls) to effectively transport the web (sheet) from one processing point to the next, and to effect the appropriate entrance and exit web path geometry for the various web processes.

In many such applications, it is important to provide a method for driving most or all of these paper carrying rolls (**Paper Rolls)**, for two(2) primary reasons:

To relieve the web being processed from providing the surface force (strip tension) otherwise necessary to drive these rolls. This would be particularly important with webs requiring relatively low tension levels.
To reduce the roll-surface to web-surface slippage and potentially consequential web-product scratch marking.

AC drives can provide a very effective solution for optimizing the trade-offs between effectively satisfying the above two (2) considerations while reducing the number of drives required - thereby also reducing the costs and long term operational issues associated with supporting each Paper Roll with a dedicated drive control.

AC motors will inherently operate at motor shaft speeds synchronous with the frequency of their applied voltage, within the slip speed characteristic of the respective motor. As such, there are a number of web transport zones which can be effectively driven with one (1) inverter control powering multiple Paper Rolls.

The following are the established criteria for configuring multiple Paper Rolls powered by common inverters.

The AC drive inverter product must be a Scalar / Volts-per-Hertz control, as opposed to a Vector or Flux Oriented product. This is because Vector and Flux Oriented AC drive products will only be effective on multiple-motor applications if the respective motor shafts are mechanically linked.
All of the grouped Paper Rolls must be contiguous relative to their sequence of contacting the web. That is, there can be no other transport or processing equipment influencing the web between the first and last inclusive Paper Rolls. See point 6 below relative to Spreader Rolls.
All of the grouped Paper Rolls must be of the same nominal outside diameter (OD).
Only one (1) of the grouped Paper Rolls should realize significant web wrap angle. This is a relatively subjective criteria, and will vary depending on the web and process. The point is that wrap angles should have some degree of consideration.
If a Tension-Transducing Roll is a candidate for inclusion in a multiple-roll group it should at either end of the group and not inside the group. Per item 4 above, when a Tension-Transducing Roll is included, it would normally delineate one paper-roll group from another.
The Paper Roll with the greatest wrap angle of the group should have its speed regulated via an encoder-based closed-loop speed regulator, responsible for the final frequency output of the inverter.
Cross-Machine Spreader Rolls of any type must be excluded from any Paper Roll grouping and supported with dedicated drive controls, even if their OD's are common to the grouped Paper Rolls. Also, a Spreader Roll within a series of Paper Rolls would interrupt the "**contiguous**" criteria per point 2 above.

The following are the potential benefits of this multiple-Paper-Roll-per-inverter approach:

Costs of purchasing and installing the otherwise required dedicated drive controls.
Reduced drive system equipment real-estate.
Reduced drive system start-up time and costs.
Increase in Mean-Time-Between-Failure - due to fewer inverters.
Lower burden on the drive system communications network.
Lower probability of operators introducing unnecessary and often confusing Paper Roll speed adjustments. This of course is assuming that the above six (6) configuration criteria are maintained.

For web transport processes which require rapid acceleration and deceleration rates, there is one potential negative consideration when controlling multiple paper rolls with a common inverter supply.

Because of the need to use a Scalar Volts / Hertz drive with multiple unlinked motors, there is no effective capability of introducing the per-motor torque-step inertia compensation - commonly used to reduce the speed following error during acceleration and deceleration.

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