

### Web Tension & Inspection

July 24, 2008

#### Issues / Problems / Challenges

- Require web tension control that minimizes web vibration at all speeds from 2 to 120 ft/min.
- Running out of time, previous selected vendor had 8wks and couldn't get system working.
- Competition was DANAHER.

#### Solution

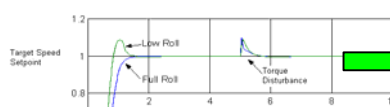
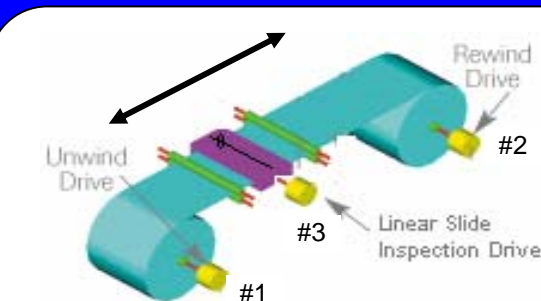
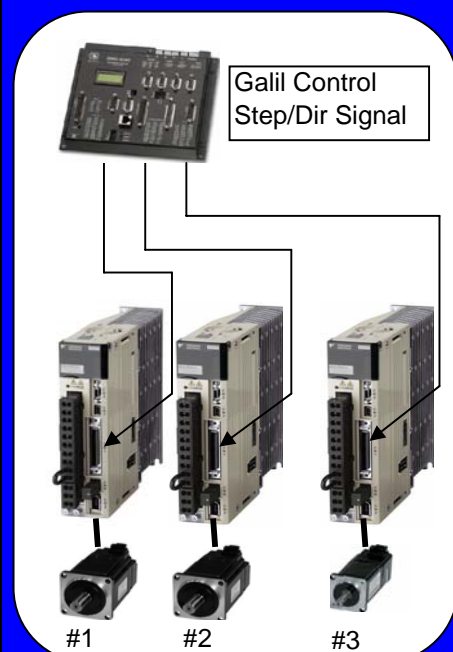
**Controller:** Galil DMC4030  
**Controller Software:** Customer  
**Interface:** Step/Dir  
**Servo:** Sigma-5 (SGDV) 3 axis  
**Power Level:** 400 W, SGMAH  
**Voltage Level:** 230 VAC, 1 Ph.

#### Performance Achieved:

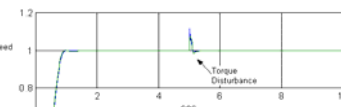
**Throughput:** 2-120ft/min  
**Accuracy:** <5% torq variation  
 <1% spd regulation  
 3 micron pos (axis 3)  
**Auxillary Functions:** Adaptive Tuning

#### Customer Information

**Industry:** Solar Energy  
**Application:** Web Tension & Inspection



Previous system - unable to achieve at all speeds without retuning servos.



New system - better control of torque disturbances without retuning.

**Distributor Comment:** "Cabling and connection to the amplifier was easy. This was the only system that could have been pulled off in this short time."

**OEM Comment:** "These guys did in 1 week, what the other supplier couldn't even accomplish in 8 weeks."

**End User Comment:** "Its unbelievable how much progress they made in one week. I'm very impressed"

#### Application Description:

This three-axis machine controls an inline inspection/validation process on a stainless steel web that is later used in solar panel production. A 22" wide by couple thousands of an inch thick steel web is unwound from the pay-out roll and re-wound on the take-up roll. An inspection laser is "zone" positioned laterally by a 3mm pitch precision ball screw to validate the solar film previously adhered to the steel web, and the web is ran back and forth through full unwind/rewind periods until all inspection zones are covered. Inspection data is later used to notch out failed web. The control challenges are: 1) load variation caused by diameter change, 2) requirement for accurate torque control at a wide range of production speeds, and 3) run at different tension settings from 5 to 60lbs --> all of these must be provided without producing excessive vibration in the web. As the diameter changes from 4" to 18", the motor sees from 2 to 19:1 inertia mismatch. The line speed must operate anywhere from 2 to 120 ft/min. Payout and takeup axis have a 40:1 gearhead and are in a master/slave configuration with master in pos and slave in torque modes.

Idler wheel with encoder provides secondary feedback to close position loop for the master in upper controller, resulting in a simplified control system (simply jog the master). Analog input for load sensor directly into upper controller.

#### Differentiating Solution Features

- Product in Stock
- Adaptive tuning algorithm, 2 min tuning time.
- One set of tuning gains valid for ALL speeds!
- Anti-vibration filter, 20bit encoder, 1600Hz resp.
- Technical support from Certified Distributor

#### Resulting Solution Benefits

- Received & installed within 2 days.
- System was running within spec in 5 days.
- Smoothness of motion within the web.
- System could handle changing inertia loads
- OEM and End User gained significant confidence in the products and support mechanisms.