PURPOSE

In a float glass facility, a very important variable that *should never* be varied, if possible, is the tonnage of glass flowing through the process. Because controlling tonnage is so very critical, position control of the tweel must be implemented. The tweel is responsible for the tonnage flow through the float bath furnace. If the tonnage is low, an operator raises the tweel to allow more molten glass to flow into the float bath. If the tonnage is high, an operator lowers the tweel to allow less molten glass to flow into the float bath. Manual and automatic (PLC) control of the tweel are incorporated in the **StewartFloat® Automatic Tweel** system to maintain tonnage.

DESCRIPTION

When a signal is sent from a PLC or from the operator to the tweel apparatus, the tweel is told to move vertically at some speed and increment. A signal is sent to a servo drive that controls a servomotor / gearbox which is attached to one of the jackscrews of the tweel. The servomotor then turns the gearbox and screw to make the desired amount of travel of the tweel. For position control purposes, an absolute position encoder is mounted on the tweel apparatus.

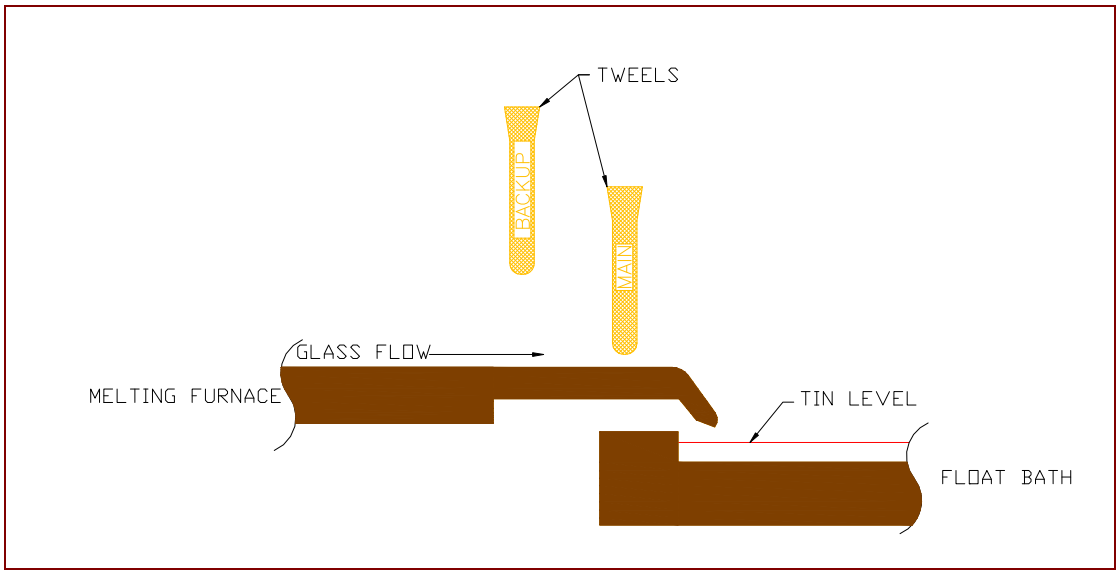

Figure 1: Typical Tweel

Typical Manual Operation - What and how determines tweel movement and position control? The operator must have a way of knowing if the tonnage has increased or decreased. This is accomplished through the use of periscope cameras located in the float bath furnace. The cameras are positioned to focus on the edge of the glass pool and this view from the camera is monitored in the control room. When looking at the monitor screen, the operator can see the position of the interface of the glass pool and the molten tin. If the glass-tin interfaces move and the pool changes width, the operator knows that a tonnage change has occurred and then makes the appropriate tweel adjustment. The operator does this by pushing an enable button on the control panel. When this button is depressed, a signal is sent that instructs the tweel to make the appropriate tweel movement, thus maintaining the desired tonnage.

Along with the operator's enable button, there are typically three other switches mounted on the control desk. One Switch #1 is Lower, Off, Raise. Switch #2 is Slow, Off, Fast. Switch #3 is Manual, Off, Auto. Each tweel (one primary and one back-up) has a set of these switches. The same control concepts also apply for both of the tweels. In normal operation, only one tweel will be used.

Existing physically on the tweel are limit switches. These switches are present to avoid physical damage to the tweel apparatus, which is to stop the tweel from traveling too far which would cause mechanical damage.

StewartFloat® Automatic Operation - For PLC control to take over, Switch #3 would be set to **Auto**. Smart cameras monitor the glass pool position and width. These variables are then input to a video analyzer and Programmable Logic Controller (PLC), which then compares this information with its programmed reference and then determines if a tonnage change has occurred. The principle for DCS control is virtually the same as the above manual example, however the corrective tweel movement actions are initiated by the PLC with no manual intervention.

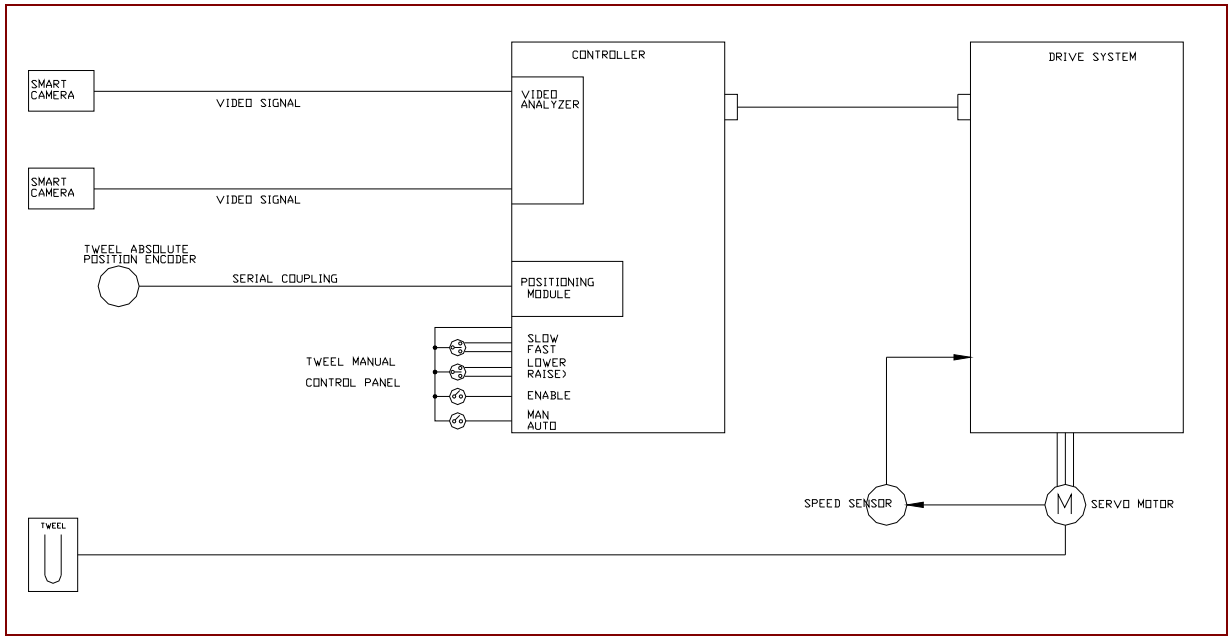

Figure 2: Tweel Automatic Control Loop

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