Contact less billet length measurement and cutting of required lengths at 4 Crank shear in Billet mill.

Present system:

Presence of hot billet rolling in billet mill was sensed by hot metal detector at a fixed distance from shear cut point (at the exit of stand 7). Measuring roll which is a DC Motor driven roll running continuously and will come in contact with hot billet for giving material speed to PLC through an incremental encoder mounted on the shaft. This roll will be lifted by a small hydraulic cylinder to have a proper contact for accurate measurement of hot billet. PLC calculates the length of billet by executing measuring roll speed pulses, presence of material by hot metal detector. Shear is having different modes like WRM, 3 equal lengths, BM mode, Sales etc., The PLC also calculates the expected length of billet in rolling process. PLC generates the real time reference to shear drive, cut initiation signal to perform billet cutting at required lengths based on mode of operation.

Details of existing PLC hardware use related to this project:

> Make: Emerson – Formerly GE fanuc 90-30 series, Processor: 374plus module (IC693CPU374+) High speed counter module: IC693APU300. Shear Program is in C Language and ladder logic of Ge Fanuc .

1. This measuring roll generates 20 volts pulses through pulse encoder mounted on the shaft , these pulses will be sent to High speed counter card of PLC for further processing.
2. The size of the billet is square 125x125x32000mm. The shape of the material at the point of measuring is diamond shape. The temperature of the billet at the point of measurement is around 1200 centigrade.
3. The billet speed will vary 1.2 meters / seconds to 2 meters /seconds.
4. The cutting tolerance required is +/- 10 centimeter in billet length of 10 meters.
5. This PLC is running in 10ms interrupt speed for real time speed measurement and reference updating to shear.

Problems:

1. Change in billet lengths from calculated to actual at regular intervals due to change in measuring roll dia.
2. Proper contact of measuring roll with rolling billet having impact in actual billet lengths.
3. Jamming of measuring roll due to lack of lubrication and others reasons are having high impact on shear cut length performance.

Improvements required:

A contact less laser based length measurement of rolling billet at temperatures up to 1200 Deg Celsius and integrating with the present PLC for accurate cut lengths. In rolling process the running billet face will be in diamond shape most of the times, but sometimes, the tail portion of the billet falls to surface side and face becomes square. This should be taken care in selection of laser based speed or length measuring device.