Rolling Mill Yield Improvement Project at African Foundries Ltd.

Yield improvement is a crucial issue for any steel plant. In order to maximize profit and reduce costs, the best approach to yield improvement is to identify areas of yield loss that can be effectively regained within the limit of available resources.

The optimization of the rolling mill at African Foundries Ltd. in Nigeria was performed using Automazioni Industriali Capitanio (AIC) technology. The goal of the project was to increase the productivity (i.e. maximizing the non-defective product) while increasing the profit margin of the plant & optimizing productivity with a great improvement of efficacy, efficiency & rolling performances without any investment in new mechanical equipment.

The delivery area (cooling bed entry system) & rolling mill shears were defined as the most critical zones. Thus, new command logic for the delivery area was designed by AIC. Cooling bed is now running on torque mode that allows the load on the pinch rollers to be balanced. PLC of line A & line B has now been synchronized with the mill. Moreover, all rolling mill shears have been synchronized with the line speed. This step also included new auxiliary service control logic, as well as high-speed and cut apron lines automation with cut length optimization.

The AIC controller gives the system the possibility to optimize the position control thus reducing the load necessary by the shears for cutting (fig. 1 & 2). This will reduce the wear and tear on both the mechanical equipment, the electrical drives and motor system increasing the total life cycle of the equipment.

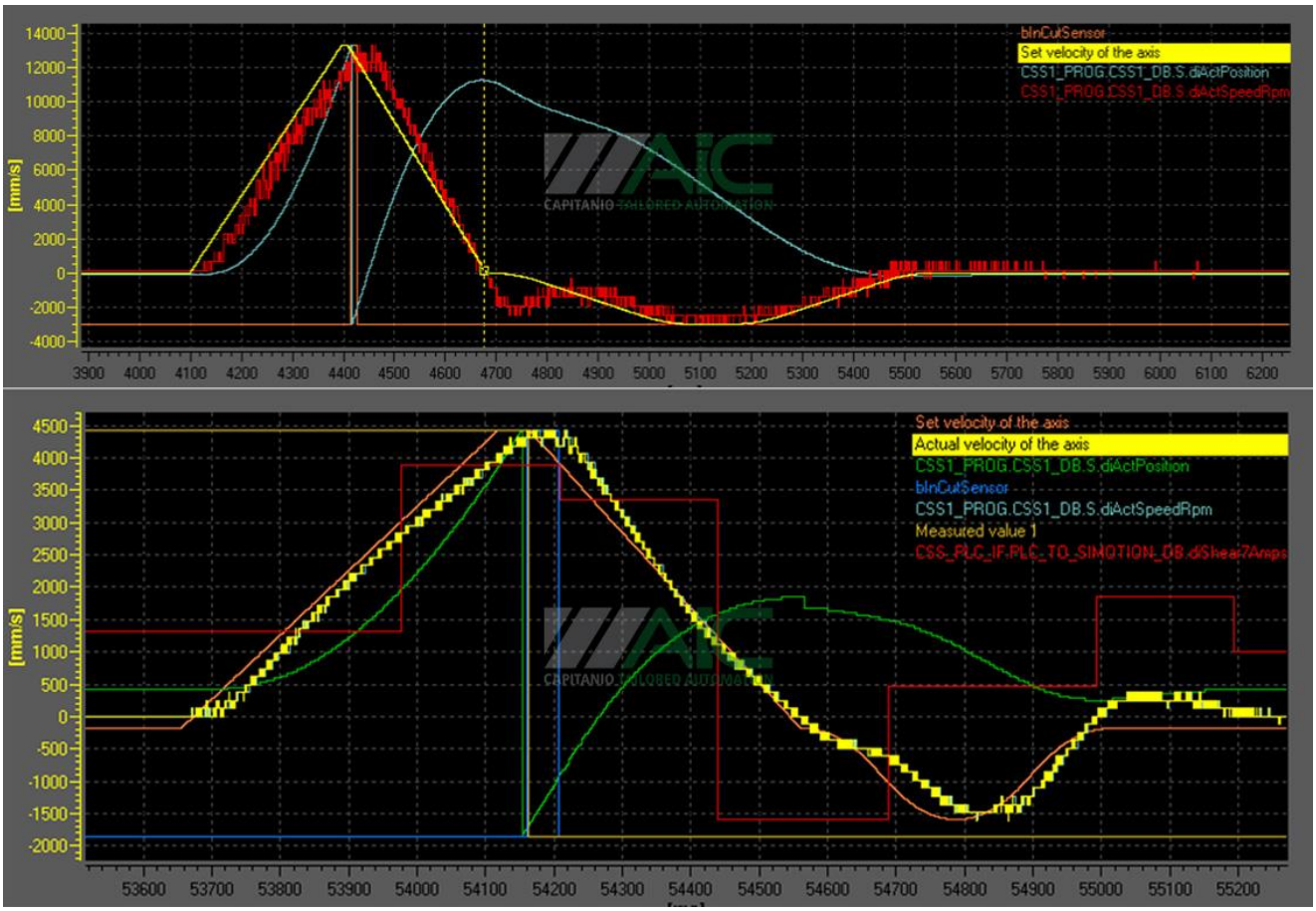

Fig. 1 & 2 – Optimized motion control performance

AIC Automazioni Industriali Capitanio sites:

- → Italy (Headquarters, Engineering & Workshops)
- → United States of America (Sales & Service)
- → India (Sales, Engineering & Service)
- → Brazil (Sales, Engineering & Service)

To sum up, two different areas of modifications can be distinguished:

1. Hardware Modification
   - Rolling Mill Shears: The normal controller has been changed to drive-based SIMOTION controller
   - Twin Channels: the normal controller have been changed to drive-based SIMOTION controller
   - Cooling Bed: it has been changed from PED-based to tracking-based
   - The drive-based SIMOTION controller integrates motion control, technology, and PLC functions directly into the drive
2. Software Modification
   - The existing software upgrades
   - SIMOTION SCOUT software was also added to the existing one
   - SIMOTION SCOUT combines motion control tasks, PLC tasks, technology functions, and drive configuration in a single system

The advantages of AIC technology are:

1. High cutting accuracy & repeatability as well as cutting optimization strategy: the system automatically calculates an optimal cutting strategy to minimize material scrapping. This system can also take advantage of a pre-optimization shear to scrap the material in the middle of the rolling process.
2. Cut cycle simulation: the system allows the operator to simulate the presence of a billet, with a prearranged length, in transit in the rolling mill at the selected line speed. Through the simulation, it is possible to verify the correct operation of every machine involved in the cutting cycle & the unloading.
3. Complete process optimization, including shear control, cooling bed, finishing and delivery area optimization for aprons, high-speed twin channel.
4. Performance of Shear 1 has been improved in both lines, since cut-to-cut variation of length has been minimized. Therefore, the monthly percentage of crops has been reduced.
5. Cobble due to twin channels in cooling bed area has been reduced since we are running on position control now.
6. Variation in length in cooling bed area has been minimized, hence monthly percentage of off-cut/short-length has been reduced.

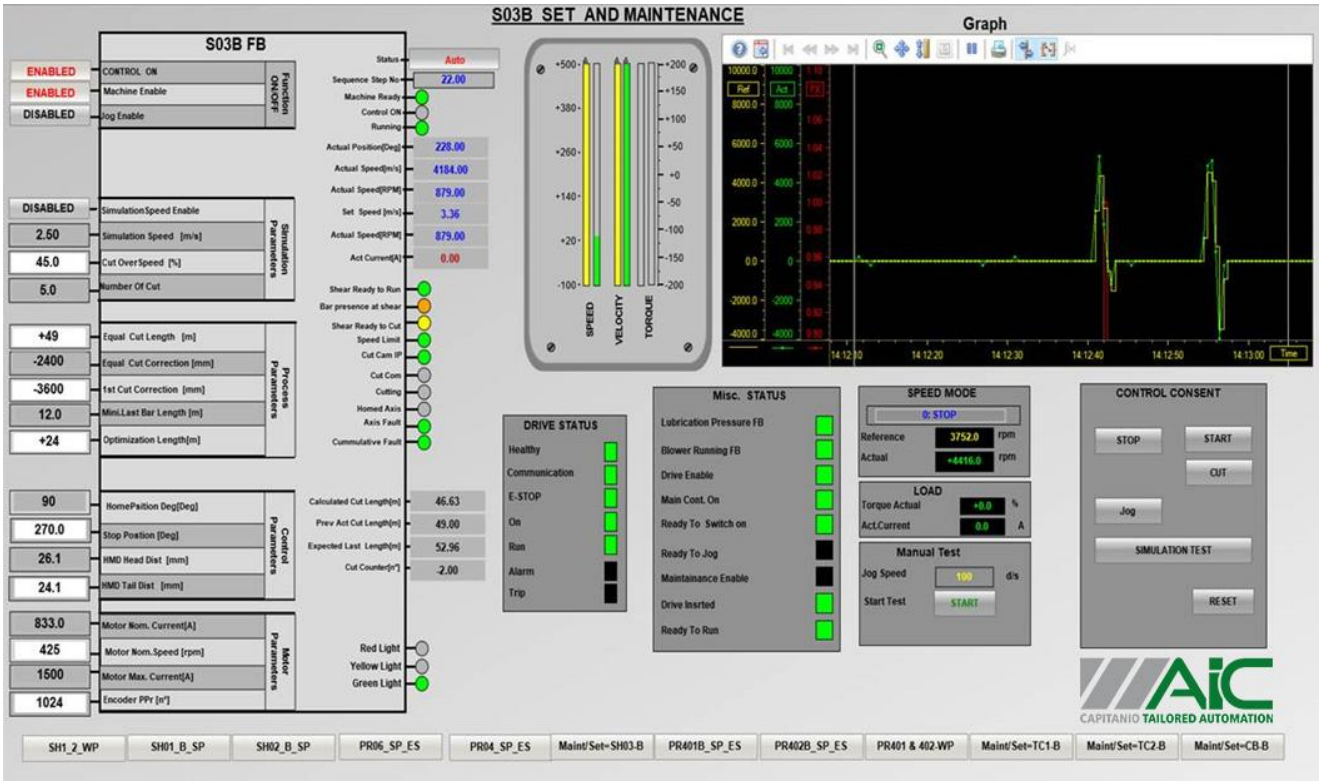

Fig. 3 – Equipment maintenance screens (adapted interface for operators)

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As was mentioned by the customer, AIC has excellently completed its jobs. After successful commissioning, there was improvement in yield of the mill, stability in a cooling bed area, cut to cut length accuracy in crop shear and diving shear, section wise recipe for every section can be saved in HMI and all mill HMI were integrated in single HMI.

AIC is a global system integrator providing advanced and tailored automation and robotic solutions for the steel industry, with the aim to continuously improve both efficiency, competitiveness and safety of the production processes. With more than 1000 applications worldwide and more than 40 years of history, AIC can boost a unique experience in both greenfield and revamping projects in meltshops and long products rolling mills.

African Foundries Limited (AFL) is a mining and metals company located in Nigeria. The plant is part of African Industries group focused on development of steel industry in Nigeria using international technology and quality comparable to international standards in the manufacture of Iron rod, Angle, billets, wire rod, nails, BRC mesh and other steel profiles.

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