



At Sora -Burgo Group- a Vari-roll Jagenberg Rewinder control system and regulation was done. Using the "Reborn" device, the old drives were replaced by the latest and evolved "winder-sael". Just in a flash time.

SAEL s.r.l. VARI ROLL Sora

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A SAEL challenge against the time. Without any risk a perfect job was possible in two weeks of production stop. But this was done in a third of time. Thanks to a long time experience on this specific revamping - Varidur, Variroll, Variplus, Variflex, Varitop, Varisoft Rewinders - SAEL built many "software packs" over the years. The right combination of those packs allows a perfect job without any start-up waste of time. This Vari-roll Rewinder mainly involved the old DC drives replacement - 90's SIEMENS dc drives, who caused problems over the years -. Based to the Burgo's **Technology & Investment** policy assumption who keeps the 100% efficiency as a top priority, the Management engaged SAEL to countermeasure the problem. The mission was not to keep safe the drives at the maximum Vari-roll speed only - who was slowed avoid drive crashes before - but to look for the next steps too:

- Counter-Knife positioning control revamping - TELESET group
- Shoulders positioning equipment
- MMI - Man Machine Interface program renewing - PLR group

This is a SAEL development who allows a friendly, intuitive, management by the operator. The mission was to get a perfect integration between the old

existing equipment and the newest one. To do that a specific joint area was selected and managed by a S7 PLC, flexible and easy to drive during the take in place. The CPU capacity selection was done to support any further machine steps. Towards will be a Profibus absolute encoder management - obsolete TWK absolute parallel encoder replacement -; step motors re-use for the counter-knife positioning; running sequences reorganization; loading /



First Rise after 4 start up days



Old Siemens Drive before the modification and the “Reborn” replacement

unloading machine according to the latest Safety regulations.

Machine Operations Constant Monitoring

The SAEL solution was “born and raised” according to the Altavilla Vicentina T&I Burgo’s team and coordinated by the Paper Mill technicians it selves. Actually this solution is a standard covered on many

other applications. The Vari-roll complexity required a bunch of visits in the plant before. Actually the right hardware structure, as much as the components placement or the system interconnections management are the milestones to achieve the customer targets like cost and time savings.

The preliminary investigations allowed to identify and plan the best solutions to meet the customer targets. A stand fitting job was done before: pre-

assembled panels with proper hardware interface inside to connect the old existing control and the new one. To minimize any start up risk all the software and the communication net were bench-tested before.

Nevertheless some problems came up during the start up phase but the right New S7 PLC capacity selection allowed immediate countermeasures as much as get a better diagnostic machine management.

To an easy supervisor management a ZHZ system is used. The ZHZ system manages the stops in meters and programmed diameter stops as well. This feature allows the commands and the coordination over a single operator station vs. old and single bunch of hardware used to drive the motors before and located in different places. The workers as much as the maintenance team did love this system. Not because of production efficiencies only, but for a friendly user and easy to drive management too. Actually this facilitates all the insert, start and drive operations. Thanks to the powerful supervisor who incorporates a lot of trend and variable calculations, the people can constantly keep an eye to



Unwinder Siemens Drive restarted after the modification



View of the Vari-Roll Drum, SAEL Intelligent Drive

the machine operations and make adjustments eventually or get a feedback in case of wrong settings or paper rips root causes as well.

Another important feature is the load cells exclusion to the pull regulation without any quality fault over the production. This can be done by a specific motor torque algorithm calculation who encloses all the inertia or friction compensations. A direct benefit is to not use old transducers or obsolete analogic devices too weak against vibrations or roller lurches causing a lot of problems to the material pull regulations.

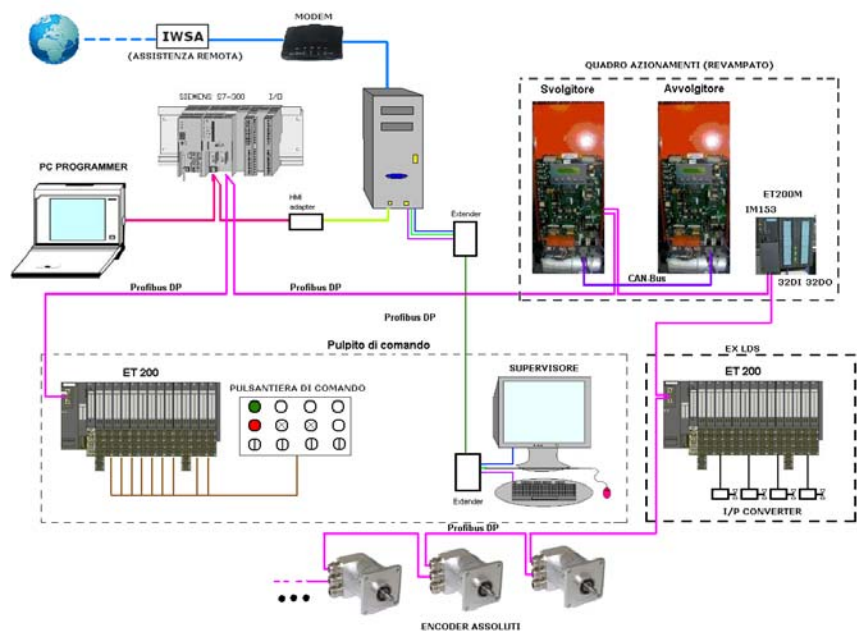
managed by the existing TELESET-TELEBOCK-LDS-PLR former logic.

Some of those features were implemented into the new automation already. Therefore it was necessary to integrate the hardware and software for the single press stations and the knife-shoulders positioning - got from the Profibus DP absolute encoder - into the New S7 PLC. As already mentioned, the S7 capacity and architecture were chosen for this mission at the beginning. This allows to:

- keep away all the Teleset-Teleblock equipment and related communication/interface accessories.
- Keep away the “Gemux” rider units for the TWK absolute encoders used in the longitudinal knives and stations - a maintenance people obstacle since the beginning.
- Keep away all the aux units related to the old system - displays, interfaces -.

Simplify and Rationalize the machine automation

The existing interface between the TELESET-TELEBOCK-LDS-PLR and the general using is made by a mix management of physical in-out and serial communications where the PLR is the core of this old process control. The mission is to bring the system to a next level using a modern PLC-SUPERVISOR integrated system who incorporates all the calculations



Architecture Block Diagram used by SAEL over the applicaiton



Main Drum drive SIEMENS recovered by SAEL Reborn

This upgrade highlights how the simplify and rationalized machine automation is.

The new control managed by S7 in combination with a scada/MMI Supervisor incorporates all the old system features in one task, and thanks to the latest advanced technologies plus the skills of the local team get them better.

The new equipment as a substitute of the old Jagenberg system, and built with equivalent connections to the original hardware, will allow the wiring team to take in place the job in less than four days.

The new SAEL system architecture who will put in place later on is based on

the new Profibus network managed by the S7 PLC - already used in other Burgo plants. This will enclose:

- q.ty 07 - Profibus absolute encoder for upper knives and lower counter-knives
- q.ty 12 - Profibus absolute encoder for paper roll holder shoulder positioning
- q.ty 01 - Local ET200M - To integrate some commands of the existing pupler
- q.ty 03 - Local ET200M - To integrate the old electromechanic commands with the new SAEL device "general uses"

Basically all the former system was totally electro mechanic and coordinated by 3

microprocessor racks - Each one for the TELESET, Teleblock and LDS zone. This has been replicated into the S7 PLC and managed by the "WINDER-SAEL" Supervisor: The perfect PLR evolution. Today the Vari-roll supervisor system encloses features like the Engineering Station for



PLC programming too. Moreover the "IWSA" - Internet World Sael Assistance - allows a remote control of the plant in real-time and for each single zone: all over the world a SAEL technician can support any need.

From this station is possible to set all the drive parameters and the SAEL digital boards; developed or modify any PLC Software as much as keep monitoring all the plant.

The architecture is based on Windows environment using a standard SCADA. This will keep the system fully compatible to anyone else.

The SAEL Supervisor

The Teleset-Telebock-PLR supervisor system managers to Jagemberg Vari-roll, and especially:

- Upper and Lower knives motor positioning calculation - automatically -
- Shoulder stations positioning and speed changing - fast/slow - automatically-
- Machine overall supervision within full run.
- PLC devices linked settings
- I/O visualization

- Alarms visualization and storage - On line Helper for each alarm
- Hardening check of each winding through the paper roll holder presses positioning and the upper / lower presses.

Therefore the supervisor has a bunch of sophisticated functions who keeps the entire Rewinder management inside. The most important features are:

For each Coil:

- Speed trend storage; pull set-point; - measured pull;
- sum of the linear forces and the contact press within a trend and two files parallel - also got in different times - by a double visual graph. This allows to keep control the winding set procedures matured along the way

Make a tab of settings for the whole machine like:

- Cylinder pressure of the paper roll holder stations = $f(\text{Major Diameter Wrapped})$
- Pressure of the internal press cylinders = $f(\text{Major Diameter Wrapped})$
- Pressure of the external press cylinders = $f(\text{Major Diameter Wrapped})$

- Pressure of the dampers = $f(\text{Major Diameter Wrapped})$
- Pressure of the draw rolls or external press rolls = $f(\text{Major Diameter Wrapped})$
- Pressure of the draw rolls or internal press rolls = $f(\text{Major Diameter Wrapped})$
- Pull coil = $f(\text{Major Diameter Wrapped})$
- Speed = $f(\text{Major Diameter Wrapped})$

For each of those parameters is possible to edit, modify, store or recall in a simple way 99 work-tabs. Through those functions is possible to change the Rewinder asset on real time having different paper. The experienced T&I Burgo's Team allowed to test the benefit directly to the coils getting the best ratio of quality / speed / accuracy ever. The same flexible philosophy is also applied to the knives, the counter-knife, the shoulder positioning as well. For each coil the system computes the best knife and the shoulders configuration but lets the people free to decide or modify the settings after the feasibility check out. The load and unload duty cycles are optimized as well. Nothing happened by coincidence.



View of the Drum with presses engaged, SAEL Intelligent Drive