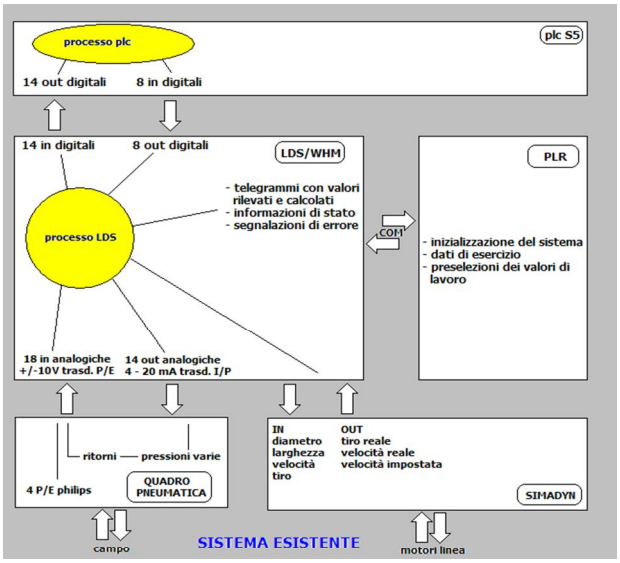
IN BURGO PAPER MILL SITE OF LUGO VICENTINO, IT WAS RENEWED THE JAGEMBERG VARI PLUS WINDER CONTROL. DURING AUGUST STOP IN "RECORD TIME" THE TELESET, TELEBOK, LDS AND PLR SYSTEMS WERE SUBSTITUTED WITH THE ADVANCED REBO-SAEL SYSTEM EXPRESSLY DESIGNED FOR THIS APPLICATION.

SAEL s.r.l..... VARI PLUS

by: **Paolo Andrighetti SAEL s.r.l.**

It's been a challenge over time, that one made in the establishment of Lugo. A further outcome job that technically could be done in three weeks stop without any risk but that SAEL and its service point PKey, managed to make and start up reducing by one third the time required. The remaking of the winder covered primarily the management of all knives placements **(TELESET system)**, shoulders **(TELEBOK system)**, coil pressing device pressure curves programming **(LDS system)** and to end Man Machine Interface programming interface system **(PLR)** which was redesigned and improved to allow users more intuitive management. The main plant target was integration between new system and existing Siemens motors control panels that remained intact, in addition to operating the entire system through S7 PLC and the elimination of absolute encoder TWK now obsolete and hard to find. Given these inputs by T&I from Altavilla, coordinated by the paper mill technicians itself, SAEL solution was born (which actually is an variation on the standards already applied in other plantings). The complexity of VARIPLUS system required a detailed survey of the plant through preliminary inspections to determine the exact hardware structure, the location of the various components and to manage interconnections between different parts of the system. The presented system was composed by following main blocks: TELESET-TELEBOCK-LDS cabinets management closely interconnected with **PLR**, main devices machine management control boards, motor control electric cabinets and pneumatic circuit control panel for the various machine pressures management. The interconnections

PRESSING DEVICES IN FUNCTION ON SAEL LDS DETERMINED TREND

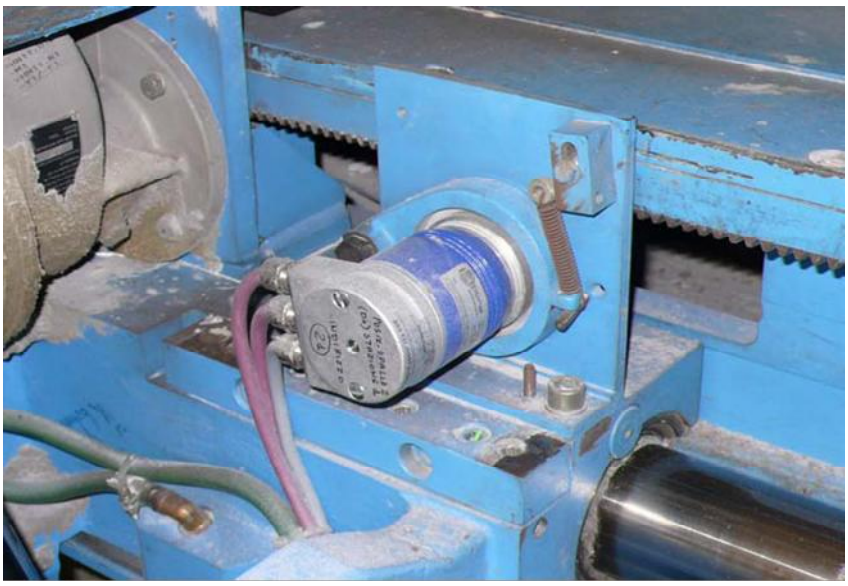


EXISTING SYSTEM BLOCK DIAGRAM

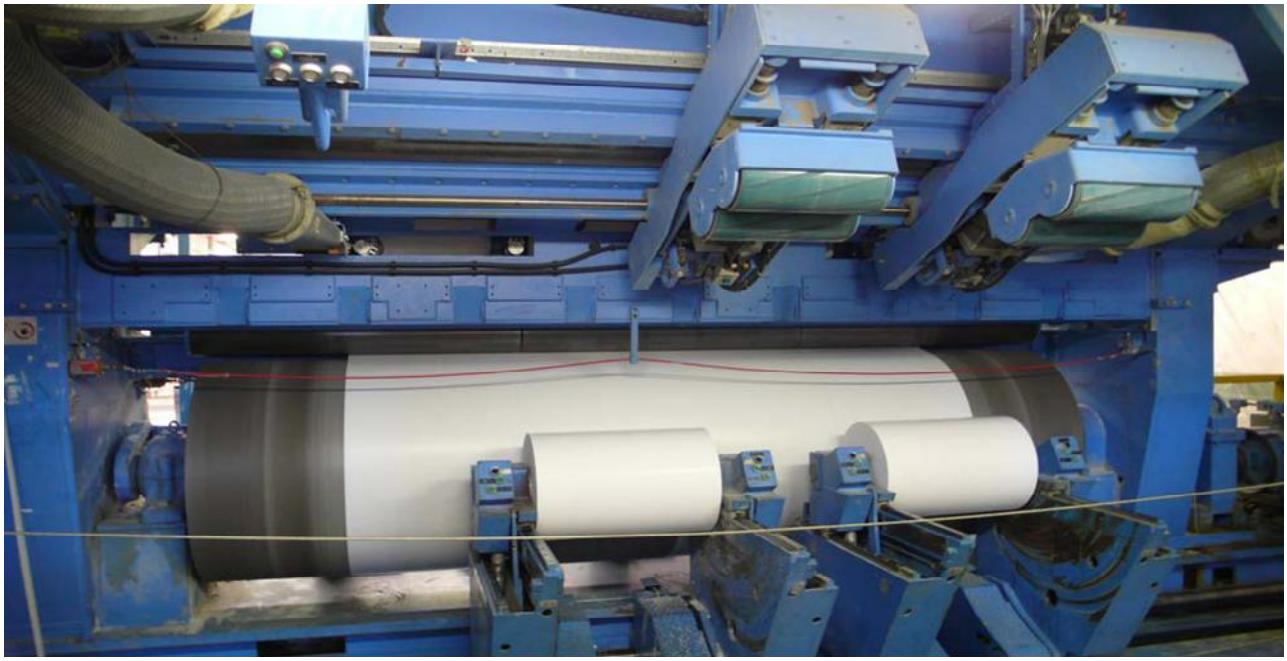
between these various devices, including some located in areas far from each other, were made either by exchange of physical input-output signals and via dedicated serial communications. The machine knives and shoulders positioning systems were operated, for computing and system settings from the PLR, while in terms of position measurement and management TELESET and TELEBOCK systems where used. Shoulder and the knife handelling was controlled by general devices control cabinet which also drove the inverter speed rate cascade exchange positioning system. The positioning of the shoulders and knives is made simultaneously with significant idle time reduction. The interfacing between TELESET-TELEBOCK-PLR and general devices control cabinet, initially managed via serial communication was in a second time handled almost entirely through discrete input-output signals. A further analysis of the system revealed that the interface between the PLR (heart of the old system) and external, was entirely managed by LDS control board in addition to a dedicated serial communication. The system that appeared to be more complex was so the LDS, interconnected to the motor control boards, to the general devices control cabinet and to the pneumatic control board, both with discrete digital and analog signals and via serial communication as exemplified in the diagram above. We have paid particular attention in the curves and winding roll pressure analysis, that may be set up and managed by PLR. For their exact reproduction we made scrupulous measurements, meticulous surveys and careful audits directly on the field. Scope of the job was so to reproduce, through a new integrated PLC-SUPERVISOR, all the process control functions currently handled by the TELESET-TELEBOCK-LDS-PLR system. It was also necessary to exactly reproduce the signals exchange between the old TELESET-TELEBOCK-LDS-PLR system and the general utility control cabinet (run by a Siemens PLC S5 Series 135) and the signals exchange with the motors control board (controlled by a SIMADYN system). To hit the target a new PLC Siemens series S7 control system was implemented combined with a supervisor made on a SCADA / MMI integrating into a single manager all functions of the previous system, revised and completed thanks to the new instruments available by

VARIPLUS PC AND PLC WITH IWSA

PROFIBUS ENCODERS MANAGEMENT



"ELTRA" ENCODERS MADE TO MECHANICALLY SUBSTITUTE TO TWK ONES

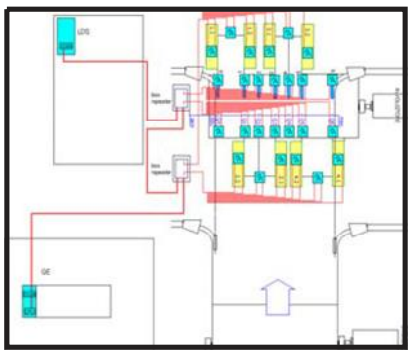


VIEW OF VARI PLUS WINDING DRUM, SAEL Intelligent drives

technology and paper mill staff experience, built through years of work on the plant. The detection of the shoulders knives and counter knives position encoders , was entirely made through Profibus absolute encoders fully manageable, programmable and reconfigurable via machine supervisor. All this was made also thanks to a unique collaboration with Eng. Bruni of Eltra company, who designed and supplied the encoders used to be mechanically interchangeable with previous TWK model in use. The encoder Profibus protocol allowed removal of old existing wiring (which used to create a bit of trouble) and facilitated all the cabling operations.

The basic system architecture is based on a new 28 nodes PROFIBUS network, through which the new S7 PLC supplied by us, handles the following devices, as you can also see in the schematic diagram:

- S5 Profibus bridge
- 7 upper knives Profibus absolute encoders
- 7 lower knives Profibus absolute encoders
- 8 reel holder shoulders Profibus absolute encoders
- 8 reel diameter measure Profibus absolute encoders
- ET200S LDS pneumatics interface
- local ET200S to integrate with cascade system

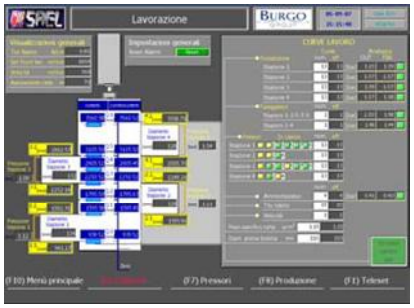


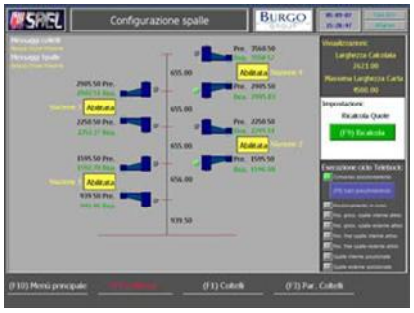
realized Profibus net diagram

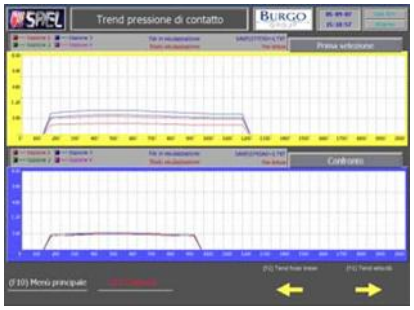
The interface between the original PLC S5 135 and the new S7 winder is made via an existing PROFIBUS bridge, called for brevity PROFI-BRIDGE. This bridge originally connected the old S5 PLC with another PLC made by the mill with meter counter and other functions in addition to the automatic slow down and machine stop. The signals exchange between the system TELESET-TELEBOCK-LDS-PLR and original S5 135 has been completely dismantled and replaced using the PROFI-BRIDGE with the new S7 PLC. In the PLC S5 original software, physical inputs have been replaced by interface bits. Another task performed was to integrate the paper mill PLC in our new S7 one, reusing without excessive modifications, all old paper mill software blocks. The interface between the PLR and PLC S5 was made both through hardware I/O supported by teleset, telebock or LDS, or even directly via serial communication. This communication was abandoned and the data exchange was reconstructed using once again the existing PROFI-BRIDGE. Over time and in the various previous jobs performed, a high management UPGRADE was done, the VARIPLUS supervisory system now also integrates the functions of Engineering Station enabling to program PLC and Drives. IWSA "Internet World Sael Assistance" also allows to remotely manage the system in real time and in all parts directly from anywhere in the world our technician should decide to intervene. In practice this control station can parameterize drives and SAEL digital cards, develop or modify PLC SW and so, remotely control the entire plant. The architecture has been developed in Windows environment using a commerce SCADA to keep the system completely open and accessible to everyone.

The new Teleset - Telebock - LDS - PLR supervision system manages the Variplus Jagemberg and in particular:

- automatically performs the calculations for positioning and speed change (fast-slow) of upper and lower knives;
- automatically manages position







VARI PLUS UNWINDER ASPO, Burgo Lugo

and positioning speed change (fast-slow), loag and unload of reel holders;
- controls each winding hardness by managing reel holders, upper and lower reel pressing devices pressures
- provides oversight of the machine status in automatic operation;
- allows the parameterization of the devices connected to the PLC;
- allows Input and output display
- displays eventual alarms, providing a help for each alarm.

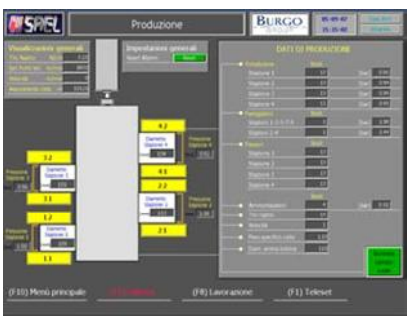
Here by side you find an overview of the most significant pages of the realized supervisor.

Most significant features are:

• storage of speed trend for each machined reel, pull set point, real measured pull, sum of linear forces and contact pressure, in form of trends allowing to compare two stored files even after time, by means of a double-graph display. In this way you can always compare winding procedures and calibrations valuing previous experience made working on the machine.

• the possibility to set up on tables all the magnitudes that determine the entire operation of the winder:
- reel holders stations cylinders pressure = f(Larger Diameter Wound)
-Internal pressing rolls pressure = f(Larger Diameter Wound)
-External pressing rolls pressure = f(Larger Diameter Wound)
-Dampers pressure = f(Larger Diameter Wound)
-Even rolls pressure or external pressing rolls compensation = f(Larger Diameter Wound)
-Even rolls pressure or internal pressing rolls compensation = f(Larger Diameter Wound)
-Ribbon pull = f(Larger Diameter Wound)
-Speed = f(Larger Diameter Wound)

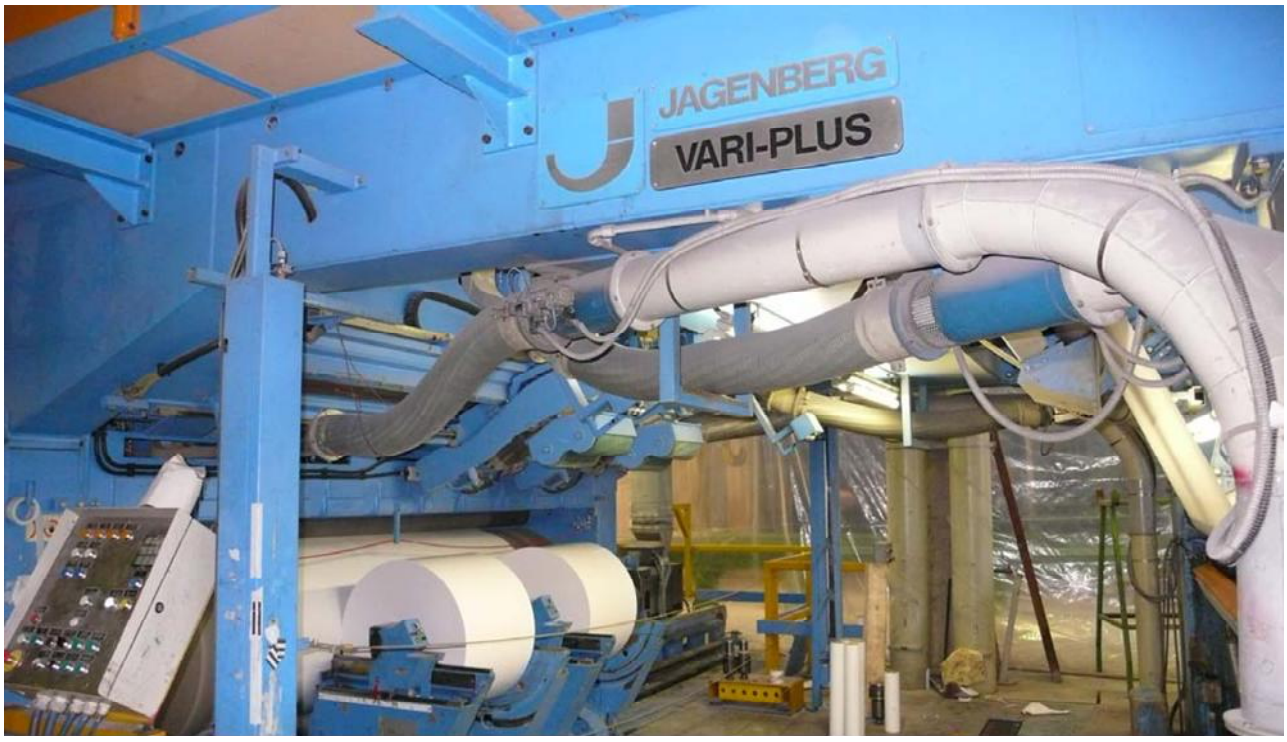
For each of these variables, you can edit, modify, save and recall in a simple and effective way 99 work tables. Exploiting these features, you can completely change the setting of the winder according to the type of paper being worked, almost instantaneously. For each type of worked paper a work trend may be selected; the interpolated value, resulting from the table depending on the reached winding reel diameter, is then treated with a mathematical formula which takes into account other factors such as the geometry of the pressing organs, the maximum applicable pressure or the specific linear actuators end force to get the final result of an optimum adjustment of the winding hardness. The experience



and knowledge of T&I BURGO specialists, made possible to check the settings directly on reels effects of calibration curves and settings applied, obtaining at the end optimal results in terms of accuracy, quality and production speed. Even the positioning of the knives and of the shoulders followed the same philosophy of great freedom to set the operation mode by providing common use positioning system main parameters. For each reel to be processed the system self-calculates the configuration of shoulder and blades to be used, and offers the optimal standard computed solution, but then leaves the operator great freedom to change the configuration proposed, subject to review feasibility of changes manually, in order to adapt the system to different production needs. You can get to obtain, thanks to this flexibility, on the four reel holders, eight minor reels with all knives, including the two extremes trimming, used as format cutting knives. Also produced reel loading and unloading cycles were optimized and after a few attempts we also managed to put back to operation the automatic unload procedure also for individual reels whose operation, originally managed by the PLR via a serial communication with the S5 PLC, was no longer functioning; the data exchange was analyzed and the functionality of the machine reconstructed restored also in this part. The result was impressive, in terms of speed and efficiency, thanks to the staff with whom we have collaborated during startup.

In terms of organization, effectiveness of the goodwill has been achieved thanks to an excellent run of the steps made by the T&I of Altavilla. Already from the beginning, planning was effective and timely and coordination on the field has given ease to all and allowed to proceed with testing in a very short time. The dismantling of the obsolete devices and the creation of new connections have been coordinated from the paper mill electro-instrumental workshop that faced and solved in a short time all the problems of an intervention of this kind, whether anticipated or unexpected, however, coordinating a team of electricians and mechanical operators already experienced, getting to start the firs tests quickly and in time. The idea of the plant management of grouping encoder chains in branches from a local repeater, has proven to be successful in terms of realization and testing ease. First we tested the machine knives, counter-knives and shoulders positioning finishing the start-up before the date on which we should have begun it. This allowed us to dedicate ourselves to coils loading and unloading sequences and calibration of pneumatic part without the worry of the time was too pressing. Finally came to the tests with paper, during which we noticed a remarkable collaboration and a willingness of all paper mill staff, from the operators with whom we have developed the procedures in detail, to get to the executives always flexible and available to all our material requests. With the whole system working in all its parts the testing of actual production begun, here really came into play all the experience of T&I who tested all the systems by seeking all the machine features limits and enhance all curves and operating parameters so as to reach the maximum possible production without losing sight of the safety and operators use convenience.

SAEL,
ART IN REBUILDING



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