



ALWAYS COMMITTED TO FACE CHALLENGES ACROSS THE FIELD OF PAPER INDUSTRY AUTOMATED ELECTRONICS, SAEL STARTED UP LAST APRIL AT CARTIERE DEL GARDA PLANT.

THE **NEW JAGEMBERG SYNCRO AS 16 CUTTING MACHINE RENEWING**. IN SIX DAYS THE OLD ELECTRIC CABINETS WERE REPLACED, TESTED AND THE PRODUCTION SYSTEM WAS RESTARTED ON THREE ROUNDS. NEW SUPPLY HAS INCREASED SIGNIFICANTLY EFFICIENCY, CUTTING QUALITY AND PRODUCTION SPEED. AFTER THE ELECTRIC RENEWING AND MECHANICAL CHANGES MADE BY THE MILL STAFF, PRODUCTION SPEED WAS **INCREASED BY 20%** FOR THE NEW EQUIPMENT ALLOWS A SIMPLER AND MORE INTUITIVE PLANT CONTROL.

SAEL s.r.l. cartiere del Garda

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SAEL from Vicenza, concluded on last April behalf Cartiere del Garda, the start-up of the JAGENBERG SYNCRO AS 16 electric equipment renewing at Riva del Garda plant. The provision of the contract involved the replacement of the complete Siemens based electric control, equipped with old drives Modulpac-c, the renovation of the Siemens cutting control system, the "DURAG" Jagenberg system which ran the sheet reject utility, joint detection, motorized aspiration box, and the whole pallet unit motor and management including automatic change and unload system. The supply was delivered with "turnkey" option, including elimination of all existing old electrical equipment, installation of the new cabinets and the remaking of all electrical wiring to the machine, which were supervised by us but managed by willing and valid Cartiere del Garda electric staff. Eng. Inanna (Cartiere del Garda maintenance supervisor) and Mr. Prati (Electric maintenance supervisor) as machine renewing project managers, also made a general plant restyling including mechanical and sensors changes so as to give the ancient plant a new

youth. The mechanical changes managed by the mill staff, covered removal of old motors and relocation of AC ones, installation of new aspiration box control system, rebuilding of the pneumatics, including the degressive braking system control cabinet and update of the machine safety repairs and a makeover load carousel system. This work made in synergy with SAEL, allowed from the earliest tests conducted during the start up, to state an excellent cutting quality improvement over an increased machine speed, it was easy to see that

the investment could be amortized in a short time.

The overall characteristics of the cutter are:

- Year of construction: 1975
- Cut width: 1600 mm
- Format length: 600-2030 mm
- Max. speed: 250 mt/min
- Cut precision: +- 1 mm format < 1000 mm +- 1 °/°
- Angle precision: +- 0,5 mm over 1000 mm of side length
- Sheet storage: max stack height 1700 mm
- Machine load: Turning platform load stations with 6 unwinders



Electric cabinet Jagenberg AS 16, Cartiera del Garda, Aprile 2007



- Braking: Pneumatic of degressive type with unique I/P control for all 6 unwinders
 - Drive Control: DC Siemens TRANSYDIN for press, knife and slow carpet control
- Specifications for new equipment were:
- Speed setting and display
 - Cut format setting and display
 - Pallet and total sheet count setting and display

- Each coil braking setting and control
 - Setting of automatic pallet change mode for count
 - Setting of general control modes and various automatic enabling
 - Setting of machine and work parameters
 - Alarm and warning display included
- The job comprised:
- Conversion of motor control from DC to AC
 - Ergonomization of all manual movement control
 - Hardware safety circuits as requested by safety standards (emergency, protection gates)
 - Automatic square motor positioning based on format setting via linear interpolation of values in the Format/Position table detected by absolute encoder.
 - Automatic speed limiting in function of format setting
 - Synchronized sheet reject management
 - Synchronized control of aspiration box pulse motor
 - Synchronized defecated or jointed tows reject, based on two sensors

- adapted signals. Possibility to set space before and after defect detection to be rejected.
- Pallet zone photocells management
- Slow carpet fast stop management (anti-jamming function with temporary sheet flux stop)
- Degressive braking control in function of computed coil diameter
- Ream control on real pallet present sheets not depending on the number of sheet on the carpets (deleting of difference between the first and last ream on the pallet).
- Rotating reel holders and shoulders control

The implementation had to take account of several unusual features that very often when you make new electrical equipment for this target are transmitted directly from the mechanics designer to the electronic automation engineers. Having as an input only a working plant, SAEL strong with the experience acquired in many renewing jobs, was able to carry out a precise reconstruction of control systems and methods used on this plant from Jagemberg, and



Global view of the Jagemberg cutter modernized , Cartiera del Garda, Aprile 2007



Cut zone view, Cartiera del Garda, Aprile 2007

propose an appropriate offer to limit main control problems. This survey was also intended to ergonomize operations that the control staff must now perform so as to avoid mistakes or oversights that frequently result in scrap. The "DURAG" system existing on this plant, which spares are no longer available, was composed by a series of electronic cards in different racks with displays to control cutting blades motors, automatic squaring, sheet rejection, joint detection put before the cutting machine. The system currently implemented, runs the sheet rejection control so as not to create possible jams that can damage previous sheets or those immediately upcoming the scrap one.

This is possible taking track of each sheet position and knowing the response time of the mechanical part. Similarly, when a defect is detected prior to entry into the cutter, the system will discard the bad sheet with the ability to program the number of sheets before and after the scrap. As multiple sheets could be on the carpets, it is necessary to make a sheet tracking to know where the bad one is to open the sheet reject device at the right time. The aspiration box was provided with magnets to open the aspiration. Such system was replaced with a brushless motor with internal position control which, through an eccentric bearing, moves the bulkhead opening so aspirating

the sheet tail once it is in overlapping position. Also in this case the motor is controlled via PLC program to avoid jamming independently on the speed and sheet format set up. The system is completely automatic and requires no operator adjustment. A further problem not easily solved, has also focused on repetition, precise and interlocked of all pant movements. Every single movement and the automation combination, especially in the pallet unit was designed with predict function to be executed with no time delay during the start up. All motors settings, the algorithms and machine sequences, will be integrated and presented anew through the Siemens S7 PLC, coordinated by a SIEMENS operator panel MP277 10", makes good interface between operator and machine. Automation is run by a CPU 314 which holds the PROFIBUS network, interacts directly with the drives and peripherals remote I/O system. The adjustment of the blade angles, is assured by interpolated control directly managed by the PLC which detects that the cut path an absolute encoder read in PROFIBUS. The drives of the series "INTELLIGENT DRIVE", also communicate with each other through a second CANBUS network that allows a fast and direct data transfer between draw roll, knives, carpets and conveyors. Through this network is also made synchronization between draw roll motors and the blade ensuring size accuracy and fast speed change. Existing DC motrs have been substituted with AC motors controlled by our AC inverters series VD. Our drives, which maintain their communication quality even through different converters kind (AC and DC), proved to be strategic in the realization. Each of our drives, once connected to the Profibus PLC, as well as receive and inform the PLC on



turning reel load device installing degressive braking

converter/motor alarms and speed rate, allow to reduce the amount of needed PLC I/O acting as a remote I/

O unit. Each DRIVE card features on board 4 analog inputs, 4 analog out, 8 digital I/O and 2 encoder inputs up

algorithms directly in the drive, without overloading the PLC CPU.

Inside the drive it is possible to control positioning, servo-diameter, filter the signals using third degree algorithms, perform calculations, gearing, cams, cell regulators, load split, rate adaption and then send the results of these counts to the PLC. In this way the results can be used to control motors or other external devices. Relying more and more on SAEL products (inverters and DC drives "Intelligent Drive" series), simple, reliable and specifically designed for this sector, many applications were made in conjunction with the Siemens S7 PLC with which it was created through a direct dialogue the construction of a Can Bus BRIDGE card. With no extra cost all our inverters and DC drives, can communicate with the market PLC being able to exchange a series of words in reading and writing mode. Each product has been developed to meet the needs of users while minimizing the items of the control cabinet. All jobs designed using these



to 200kHz, can transmit this data to the PLC, enriching the system with control facilities and allowing to eliminate expensive devices. Another additional possibility that a so elaborate architecture can offer, is the development of various



DC motors before and AC motors after transformation



Automatic aspiration motoried system, Garda maggio 2007

Drives limit the external devices required to only commercial PLC. The peculiarity of the Drive, either DC or AC inverter is to allow the use of a single same card for all powers with the possibility to replace thyristor or IGBT, a spare card and a IGBT branch or Thyristor constitutes the whole package of replacement parts. DC power capability is more than 1MW while AC power is up to 1,5MW. The study and research for the realization of these products have become necessary in order to offer our customers technical architecture to move with the times. If analyzing the structure of a paper mill or calander or winder control, as proposed by our main international competitors, we realize a given objective irrefutable: using normally available drives on the market, the resulting system can't whatsoever be compared for performance, capacity and technology to those made by parent companies. Multinationals adopt proprietary systems in addition to the

drives and inverters to achieve the most acclaimed performances. In other words, no system or systems integrator could build a system comparable to ABB®, Siemens® with the only commercially available products. For these reasons and after many applications and alternating, we have developed our own product to be compared to the competition at this level. Our system, based on the digital drive “sectional control” is the first system today available without MASTER

computing processor, where distribute intelligence is solely based on AC or DC drive computing power. The system is rising wide interest in all engineers who have been subjected, as it fully responds to all needs related to the conduct of a modern paper mill, a rewinder or a calender. It processes AC or DC drive fully managed reference regulation, and is supported by 1 Mbit/sec MULTIMASTER high-speed CAN BUS network. This leads to a qualitative difference compared to other systems that normally take master-slave type as PROFIBUS networks in which, in case there are many participants in the network, would slow down dramatically the BUS speed increasing communication delays. The architecture we used ensures extremely fast processing speed: 6 msec. 60 AC or DC motors. Another ‘gem’ of SAEL in solutions to its customers is the new system “REBORN” means a system that can reuse an old existing electric equipment saving over 50% of costs.

The aging of existing sectional controls, legacy for maintenance at the premises of our customers, has provided a strong incentive to find a solution to offer our customers to renew old drives matching the operational reliability of modern controls. We designed this rack with the scope to grant reliability, substituting every marketplace drive control (we treated EVERY drive brand) with our “intelligent drive” control, reusing all the existing electric power components (SCR, contactor, line reactor and fuses).



Some pages displayed on the video-keyboard unit performing machine operator interface