## PRODUCTION RECORD AT THE BURGO PAPER MILL IN MANTOVA.

**THIS RESULT HAS BEEN ACHIEVED AFTER THE TRANSFORMATION OF THE EXISTING CONTROL CABINETS WITH THE REBORN SYSTEM AND THE SUPPLY OF NEW CABINETS WITH SAEL INVERTERS, AC DRIVES WITH 690VOLTS DC BUS. THE MODERNIZATION WORK STARTED ON THE FIRST DAYS OF MAY AND AFTER ONE WEEK OF ADGUSTMENTS; THE HIGHEST PRODUCTIONRATE EVER WAS REACHED.**

# SAEL s.r.l.... AC DRIVE 690V

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

The reconstruction of the control cabinets at the Burgo paper mill of Mantova has been concluded. This regarded the modernizing of 23 Ansaldo DC Drives with our REBORN system, and the adding of four new cabinets with AC Drives for the control of a section of dryers, the in-line calander, main 1100kW fan-pump and the 315kW dilution pump of the modulejet. Work at the paper mill was coordinated and managed by the directors of Technology & Investment Burgo, together with the paper mill managers Ing. Bottino, Ing. Beltrame and Ing. Nicoli. This regarded the whole of the paper machine, which was modified radically with the reconstruction of the whole approach flow system, the substitution of the head-box, the first dryer section and finally the insertion of an in-line calander. Some numbers: 10mW installed power just for the paper machine motors, 400 tonnes of paper is produced per day, 7 meters is the paper width, 1400 meters per minute is the maximum production speed the pepar machine has been designed for, and Burgo wants to achieve that speed next year. The plant conversion personnel, (electrical, mechanical and qualified paper mill personnel) reached a total number of 400 people per day working shifts for a duration of at least 2 weeks. The paper produced by the paper machine supplies the major rotary presses of national newspapers like RCS group, la Gazzetta dello Sport, Il Sole 24 ore, La Repubblica, Libero and a whole lot of other daily newspapers all over Italy and Europe. It is estimated that 1.700.000 daily newspapers are being printed on paper produced by the Mantova mill each day. The record breaking production speed of 1200 meters per minute, has rapidly repaid the enormous investment, in personnel and resources made during the conversion. The production predictions, in terms of speed and efficiency where fully respected, and the quality of the finished product, which was the main reason for which the investment

**MANTOVA PAPER MILL, VIEW FROM FORMING AREA, SAEL Intelligent Drive**

was approved, immediately satisfied the paper mill which stated that the feedback from their clients was excellent.

Going back to the part supplied by SAEL, the dominant and most technological part of the system were the AC drive cabinets, for the control of the dryers, calander and pumps. These were new motorizations, thus the choice logically was to use AC motors at 690Volts in order to reduce the cross section of the cables which had to travel on average 150 meters from the drives to the motors. The power supplied to these cabinets is by a new transformer in order to avoid interference towards the DC drives which were REBORN. The structure of each unit is such that each inverter can be isolated from the DC-bus or inserted onto it, without switching off the mains supply. Between the motor and inverter, there is a decoupling reactance in order to soften dV/dt fronts that can shorten the lifetime of motor windings, and a contactor which ensures total isolation for motor maintenance operations. Because of the necessary power, two separate cabinets for the calander and dryer sections were engineered, whereas for the two pumps the STAND ALONE solution was chosen. The machine's fun pump was motorized by two 530 kW AC motors for a total of 1060KW installed. Two cabinets were supplied and positioned next to each other, both independent but controlled in torque. In case one of the two motors or inverters should have a breakdown, production can continue at a reduced maximum rate. Also the 315kW dilution pump Modulejet, had the same architecture of the main fun pump, and was supplied in a stand alone version. The other motors of the machine were modernized with the REBORN system. Once again SAEL's REBORN system proved to be the simplest and most flexible one for the reconstruction in paper mill plants. The fact that the REBORN system has been adopted in almost all plants of the Burgo Group for all types of machines, has given us an advantage when offering the reference cascade with "SAEL SECTIONAL COMAND"; the only system based on SAEL's intelligent drive which does not use a centralized cascade controller. The drives communicate directly with each other via CAN-BUS (indiscriminately weather AC or DC). This ensures a very high refresh speed between the participants of the cascade. Can-Bus is a multi-master communication system as

**Electrical cabling**

opposed to a master and slave system which is used by a lot of our competitors. This protocol, enables us to manage fully every communication. With our programming and supervision tools we can check how many communication packets are transmitted by each drive with of up to 5 day historic trends of all the communication of all the drives

**Existing DC drives in the mill after REBORN transformation**

**Cabinet room of the Mantova paper mill , march 2007**

on the bus. Any network malfunction or error in communication or drive fault is memorized together with the time at which it happened, so that it is possible to see what had happened later on in time and to diagnose precisely whether it was a breakdown or a malfunction related to the drive. Also in this case the application of the REBORN racks, done by our service point SIMI of Lucca (coordinator) and Indexa Italia 2, reused the SCR bridges of the old drives and the transformers and contactors and other reusable electrical and electromechanical components. Teams of electricians working in shifts, modified the existing drives at the paper mill, inserting the reborn kit and all the CAN-BUS communication network. Furthermore necessary modifications have been made in order to comply to the existing norms for security. The management of sequencing has been delegated to a S7 PLC, which substituted the old microprocessor board system, with its RS422 communication, which also used to handle the reference cascading. The supervision and programming system, with which the plant is equipped, provides a powerful working and control tool. It enables easy and immediate management of various working phases, allowing the machine operators to modify the process in a simple and direct way. Time and several applications, matured high level management upgrades. In fact, today it includes also the function of Engineering Station, being able to program the PLC and Drive. Furthermore IWSA "Internet World Sael Assistance" enables the plant to be remotely managed in real time and in every part, directly by our technician from any where in the world. With this system it is possible to change drive parameters, develop and change PLC software, and remotely check the whole plant. The system was developed under the Windows operating system using a commercial scada, so that it is accessible and open to anybody. The main functions of the supervisor are:

- Plant synoptic showing all the motors by zones
- Bar-graph visualization of all the electrical data
- .Continuous diagnostics of the plant's alarms
- Visualization and modification of the set-points (reference values) necessary for the control of the machine.
- Real-time trends, and memorized

**Inverter cabinet 1st and 2nd dryer, Mantova paper mill , march 2007**

paper-breaking trends

• Recipes with all machine set-points can be memorized and recalled with function keys

In these years of growth SAEL has always been able to hold pace with numerous applications always finding the right solutions to value the high technology content of these plants. Our investment in research and the combination of standard PLC's with our "Intelligent Drive", has enabled us to keep pace with the more famous electronic companies whose components had historically been standard equipment for designers of European machines. Our architecture is extremely simple, and does not require dedicated or custom hardware, leading to design simplicity and readily available spare parts. Apart from the drives, all the materials used are standard off the shelf products. SAEL's research into products has always been the point of strength in the systems built. Thanks to numerous applications and the policy of doing research on drives, we have implemented the technological and control algorithms inside the drives. The motor-controllers of the series "Intelligent Drive" today offer a vast number of possibilities to designers and builders of paper mill machines. Their software contains various mathematical blocks, which can be configured to compose all the control modes


**ELECTRICAL CABINET OF THE 1100kW FUN PUMP**

and algorithms, that are usually used in the paper industry. A potent and new software "AZWORKER", makes the approach towards the drives simple. Connections between various control blocks used for the production process are done with this tool. It also configures the drive's digital and analogue I/O's and can enable control algorithms. Year after year and month after month the drives, be it inverters or DC-converters, integrate the whole of SAEL's know how. Also on these premises in Mantova, we saw to the training of the mill's personnel, not just to manage the drives, but to fully use them. Today in the paper mill our drives are components for normal everyday usage in various type of machines, be it a single motor or a complete paper machine. Making the paper mill personnel able to get actively involved, through training courses and by giving them up to date programming tools lead to a synergy that got stronger time after time rendering the mill's technicians independent even when making small changes in the system. The integration of tele-assistance and tele-control tool (SAEL I.W.S.A.), overcomes the problems of distance, and guarantees rapid problem-solving and technical assistance at all levels. It is because of all these characteristics, that a group like Sael, is considered reliable even by a primary reality like "Burgo", which is awarding Sael with ever more important and strategic supply orders, in their plants that need revisioning and modernizing.

**MANTOVA PAPER MILL, FINAL ZONE OF THE PAPER MACHINE, SAEL Intelligent Drive**