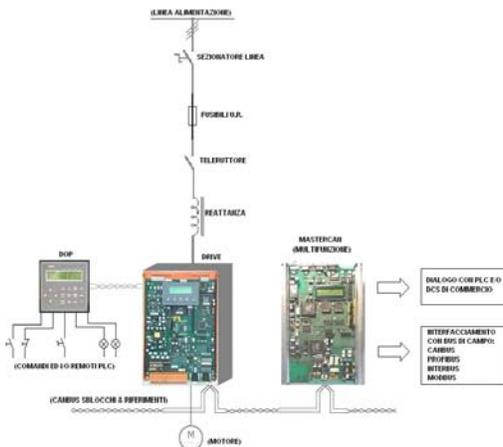




innovation and tecnologia  
**REBORN**, the revolution.....

**WORLD SAEL SERVICE POINTS**

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|--|---|--|--|---|
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WHY THROW OUT YOUR OLD ELECTRIC PANELS ON YOUR **PAPER MACHINE, WINDER, CALENDER, SHEETER, OR OTHER LINES?** SAEL, AUTOMATION ELECTRONIC SYSTEMS, HAS DEVELOPED A NEW SYSTEM TO REGENERATE THE ELECTRIC PANELS OF YOUR OLD LINES. THE SYSTEM IS LOW COST, REVOLUTIONARY AND HAS UNEQUALLED FLEXIBILITY. AFTER SIMPLE TRANSFORMATION WITH SAEL'S SYSTEM, YOUR ELECTRIC CONTROL IS RECONDITIONED AND COMPARABLE TO THE LATEST-GENERATION HI-TECH SOLUTIONS ON THE MARKET. **YOU SAVE AT LEAST 45%.** SOLUTIONS ARE AVAILABLE FOR ALL EXISTING COMMERCIAL DRIVES.



has made significant investments over the past few years. The maintenance of existing electric panels have driven us to develop a solution that allows our customers to modernize their existing old drives so that they equal the reliability of the most modern electric controls. When reconditioning old DC drives, in order to guarantee the best reliability, we developed a control rack that can replace **any drive on the market** (standard and custom). The "old" control board is replaced with our "**intelligent drive REBORN**" and all of the existing power unit parts in the paper mill (SCR

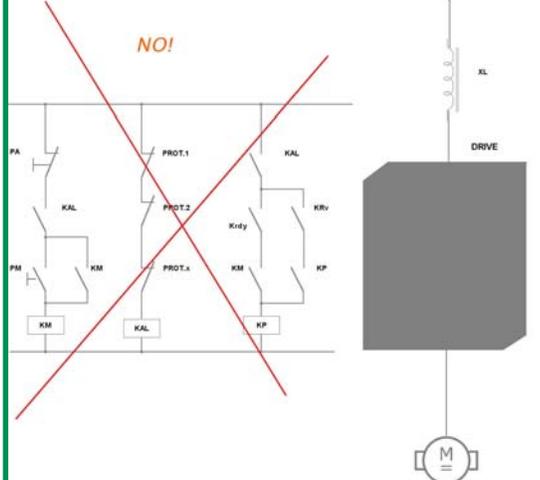
bridges, contactors, reactances, and fuses) are reused. All the relè switches, boards, and automatism previously used for operation are totally removed from the panels, leaving only the mains contactor and two serial cables. This rack interfaces directly with the SCR of each bridge, transforming the drive from analogical to the SAEL digital system with a dual field bus. The design phase considered that a number of older systems do not have PLCs and that, often, wiring must be performed quickly on site. Thus by reusing the old drives, reactances, panels, contactors, and fuses of the pre-existing system

By: PAOLO ANDRIGHETTI - SAEL SRL  
 the most expensive parts of the panel **are recovered**, containing the reconditioning cost. **The guaranteed minimum savings expected is on average 45%** when compared to installing new equipment. This led to the production of our "**REBORN**" system that, since 2000, we use in almost all our contracts. The system has all of the features of our latest-generation electric panels in terms of the inverters and DC drives in the "Intelligent Drive" series. These are easy to use, reliable, and specially designed for paper industry. Numerous applications are combined with the



Regulation rack "REBORN" supply in old Drive ABB e SIEMENS, into a slitter.

The whole following components of the drive are maintained (contactor, reactance, fuses and bridge SCR) and eliminated the whole existing electro-mechanic



“MASTERCAN 2002” board. These signals are transmitted and received across an auxiliary CAN network that replaces all ET200 intelligent remotes and the PLC that were required in the past. The auxiliary CAN network was designed so as to avoid overcrowding the main network, dedicated exclusively to the references and avoiding additional cables (ET200) in the existing panels. To perform this system simplification, we used a “MASTERCAN 2002” micro-processor board that is connected by PROFIBUS to the S7 PLC. In this manner, it transmits and receives the data via CAN for the drive. We have supplied numerous applications in the paper market,

efficiency by eliminating reliability problems due to the old converters (BMB-ANSALDO). This project turned out to be extremely interesting given the possibility of increasing the machine speed. The system manages a total of 80 DC motors and 15 AC motors up to 1,5 Mw, all of which have been reconditioned. The old control used a Hitachi PLC, which communicated with the drives using dedicated boards (one per drive), enabling operations and managing the alarms using discrete I/Os. Once processed by the PLC, the whole control cascade was transmitted to the drives as a frequency, and the drives regulated the motion of the motor with encoder feedback. The existing drive control boards consisted of analogue/digital solid component sandwich panels that, over time, had started to degrade progressively in terms of reliability. The primary objective of the plant was to replace all control boards with the new “REBORN” rack, completely eliminating any problems due to the drives. Many of these racks were replaced directly by the paper mill personnel given the simplicity of the operations. The “REBORN” rack is primarily a RISC 32-bit microprocessor board and a starter board along, with all of the connections between them, the SCR, and the drive sensors. The “REBORN” rack was prepared (including interconnecting firmware) to be frequency-controlled, exactly like the old

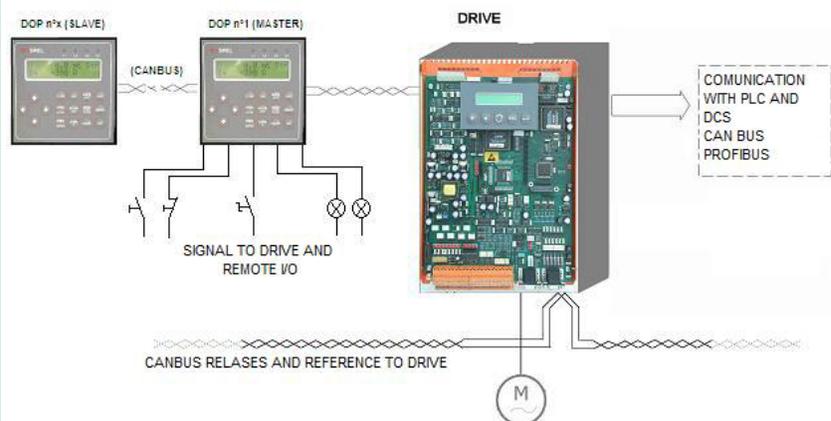
Siemens S7 PLC. A direct dialogue is created with this PLC using a CAN BUS/ PROFIBUS BRIDGE board. Without any additional cost, all of our inverters and DC drives can communicate with commercial PLCs, enabling them to exchange a series of read/write data. Enablement, parameters, references, tensions, or any other adjustment can now be processed by a PLC and sent to the drives. All the process blocks integrated in the drives can still be used (servo diameter robots, reference cascades, filters, multipliers, cell regulators, load distributors, speed adapters, positioners, etc). Each product is developed to meet the needs of our customers, minimizing the elements in the panel. These elements are limited to a commercial PLC and the SAEL “Intelligent Drive” for all project designs. The distinctiveness of each individual drive, be they inverters or DC drives, allows us to use a **single control board** that is the same for all power ratings. Thus, only one spare part is required for the entire line. The thyristor or IGBT of each drive can be replaced. A spare board and IGBT branch or thyristor make up the entire spare part package for any of our systems. DC power systems are unlimited and AC systems exceed 1.5 MW. The enablements are sent by the drives and alarms are received from the system sequence manager, the S7 PLC, across a latest-generation “CAN2 and

now let us tell you about one of our latest

## MORE THAN 1000 REBORN DRIVES IN THREE YEARS...

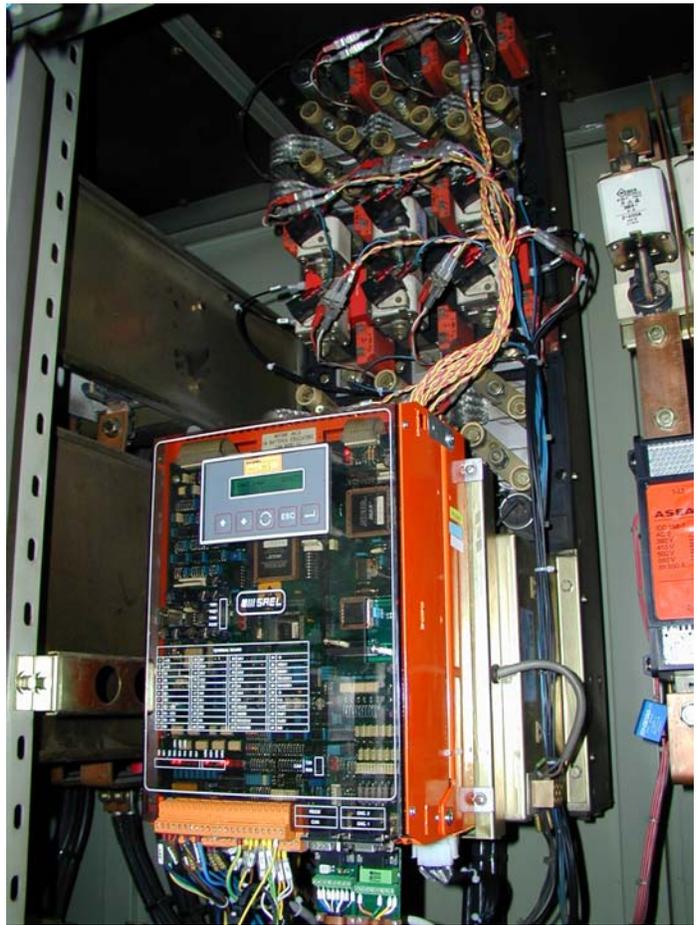
important jobs. In this job we reconditioned a total installed power of about 5 MW in terms of AC and DC motors, as well as more than 1000 I/O managed by the Siemens S7 PLC. This job was for Cartiera di SAREGO (**Burgo group**). It stemmed from their desire to increase machine

The rack is climbed on “REBORN”, if necessary to visualize the data on the control board the display device DOP and the card Mastercan 2002. Two telephone duplex cables connect the Drives among them omitting any other card and electronics for the management references and other. Every regulation of the eliminated cards is served as the software inside the Drive.

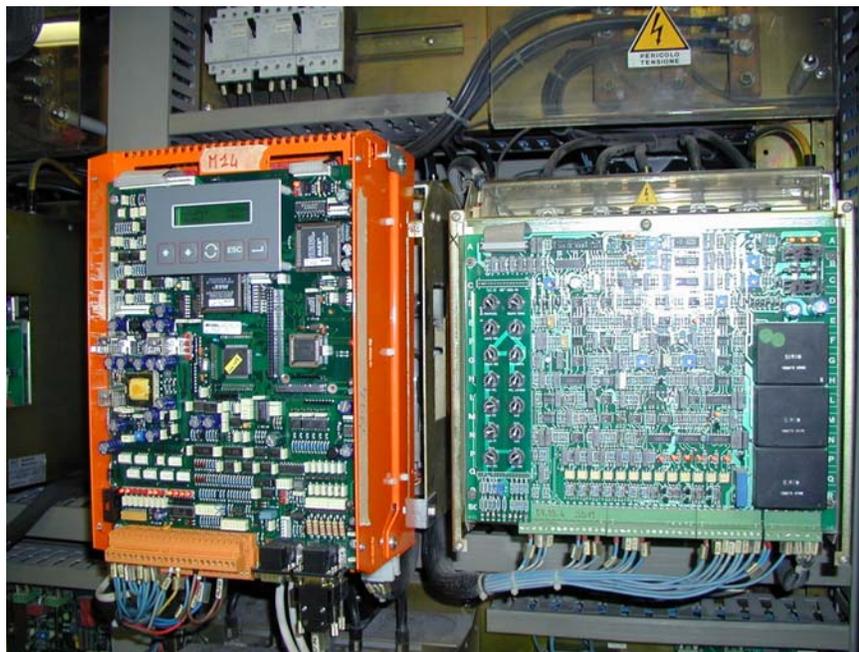


controls. Installation was performed during normal scheduled shutdowns, thus not requiring production to be stopped. After reaching the first goal, we proceeded to transfer the true control system (Hitachi PLC). Given the volume of machine inputs/outputs that the PLC managed in addition to the drives (oil system, safeties, paper break photocells, shields, blades, etc, for a total of more than 1000 I/O), a Siemens S7 300 PLC with 318 DP/L2 CPU was installed. The only scope of the PLC in the SAEL architecture is to start/stop the motors in remote at the control stations, to manage the run consensus, and to manage the diagnostics of the entire system, with the exception of the motor controls. The control cascade of the drives is performed without the assistance of a processor or server. Instead, a CAN BUS network connects all of the drives and the magnitude of work of each motor is transferred. As it is a multi-master network, each drive performs this operation cyclically, without the need to worry about collisions, which are managed directly by the integrated CAN hardware. Each time a drive receives the reference, current, cell, etc. code for its regulation from the network, the drive records it internally, processes it, and sends it back to the network. The progress of these events creates an extremely rapid control cascade (refresh time 6 ms for the 60 participating drives, which were specially developed to control the hot laminators) that is easily expanded and

quickly configured. The enable commands are sent by the drives and alarms are received from the system sequence manager, the S7 PLC, across a latest-generation “CAN2 and M A S T E R C A N 2002” board. These signals are transmitted and received by a second CAN network that replaces all ET200 intelligent remotes and the PLC that was required previously. The auxiliary CAN network was designed so as to avoid overcrowding the main network, dedicated exclusively to the references and avoiding additional cables (ET200) in the existing panels. To perform this system simplification, we used a “MASTERCAN 2002” microprocessor board that is connected by PROFIBUS to the S7 PLC. In this manner, it transmits and receives the data via



**Drive BMB with REBORN (size 630 Ampers)**



**Before and after substitution of Rack “REBORN”in drive SCE**

CAN for the drive. When the load of participants (drives) drops to 32 utilities, the auxiliary CAN network is no longer needed and it is not integrated with the primary network. This architecture also informs the PLC of the motor speeds. It can perform threshold advances at speed and timing controls among the various sections of the line. Another RS422 multi-drop network connects all of the drives for their parameterization from a single point. Parameterization is performed using our exclusive software, supplied with the line. The “DOP” video keyboard is another special feature of the system. This keyboard can connect by serial port to each drive. It can then display the current, speed, and motor alarms. It can also manage all of the commands for motor speed changes, including: increase/decrease with selection/display of set or actual speed, and scroll display; critical measurements for regulation; drive I/O status; display of ISO1 Drive alarms; as well as all the other parameters needed to fully set up the connected drive.

These controls can be separated from the video keyboard and physically located on the operator

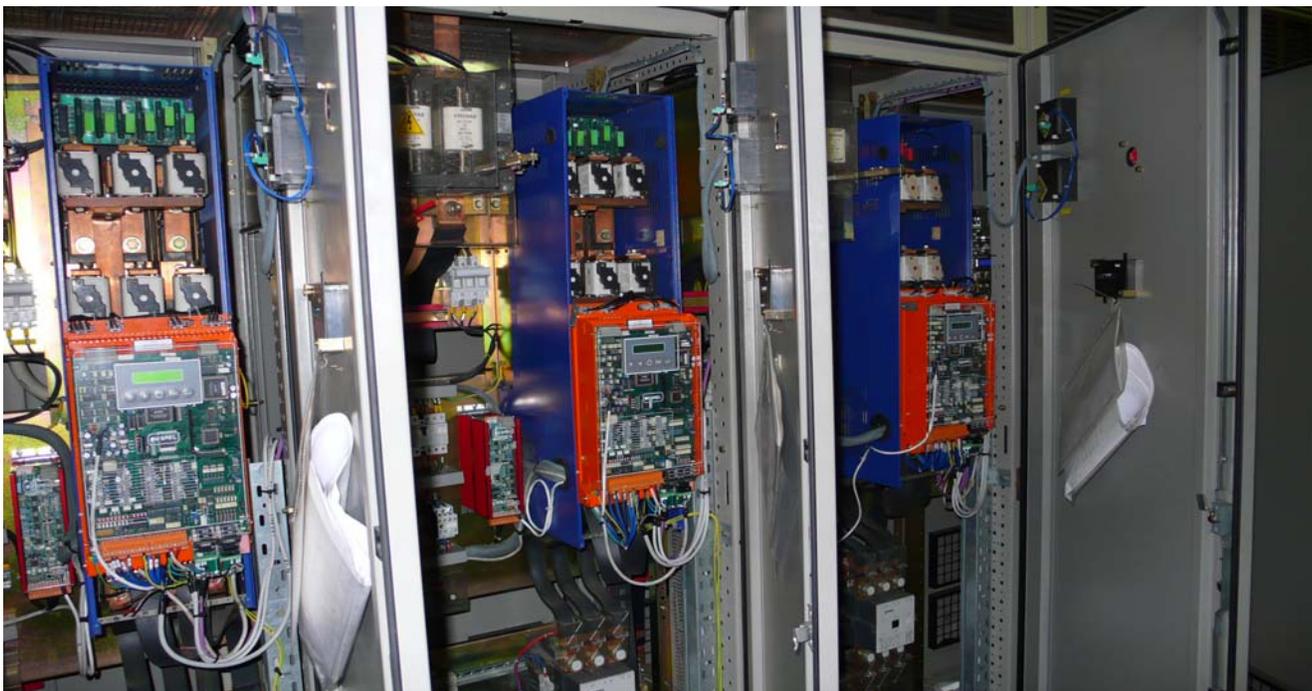
control panel using buttons. Should tension control be required, **the DOP** is capable of displaying the set tension, the actual tension, the speed correction by the controller, and it is able to set the tension parameters using software keys and controller set points (proportional and integral). The systems created using "REBORN" can be easily interfaced with machine supervision systems, allowing immediate and user-friendly management of all of the process phases. This gives the machine hands the possibility to make changes to the process in a simple and immediate manner. With default "IWSA", the supervision pages can be used to perform a detailed synopsis of all mechanical parts, which indicates each transducer enabled, diagnostics for rapid troubleshooting, and rapid statistics of line malfunctions. This provides an excellent guide and allows even operators with limited experience to run the line. The overall drive alarm management also writes an **alarm log**. This function allows any alarms to be recorded on the hard disk. The recorded data includes the date and time of the alarm and the date and time of the reset. The machine tender can comment on each alarm, providing his colleagues with information on how to resolve and reset it should it reoccur. As it is completely automatic, this log allows the customer to determine which alarms stopped the machine or caused lost run time and provides detailed statistics about the number of monthly and/or yearly occurrences.

The process recipe allow the machine to be set-up rapidly in order to reproduce the same production conditions, with just a click of a mouse. This is possible due to automatic recording of all process parameters. **The plant TRENDS** have been generated with the function " **automatic generation**"; for each paper break detected by photocell, drive alarm or manual storing, a **paper break file** is generated, listing date and time of generation. It is so possible (even through months and years) to display variables and alarms of all motors in the moment of the paper break recording also **in what machine area it had happened** (memory: 4 minutes before and 10 seconds after the paper break). IWSA, Internet World Sael Assistance rounds out the BASE architecture for all SAEL Supervision systems.



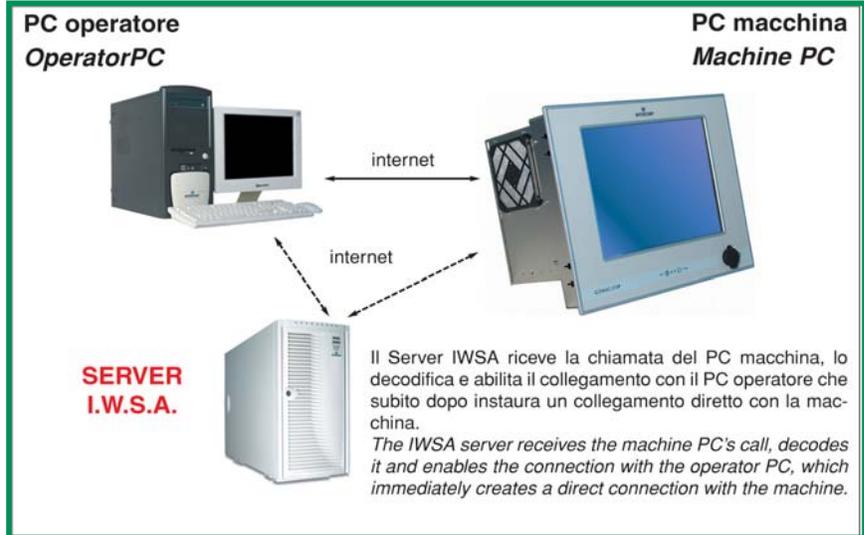
**We are there for you EVERY DAY...**

SAEL offers innovative technical service over the internet. This service is designed to allow our customers to perform those operations that in the past required the presence of our specialized technicians at their plant, immediately. This totally eliminates the distance between our



**above and up: REBORN applied on other drives of commerce and in an electric cabinet ANSALDO**

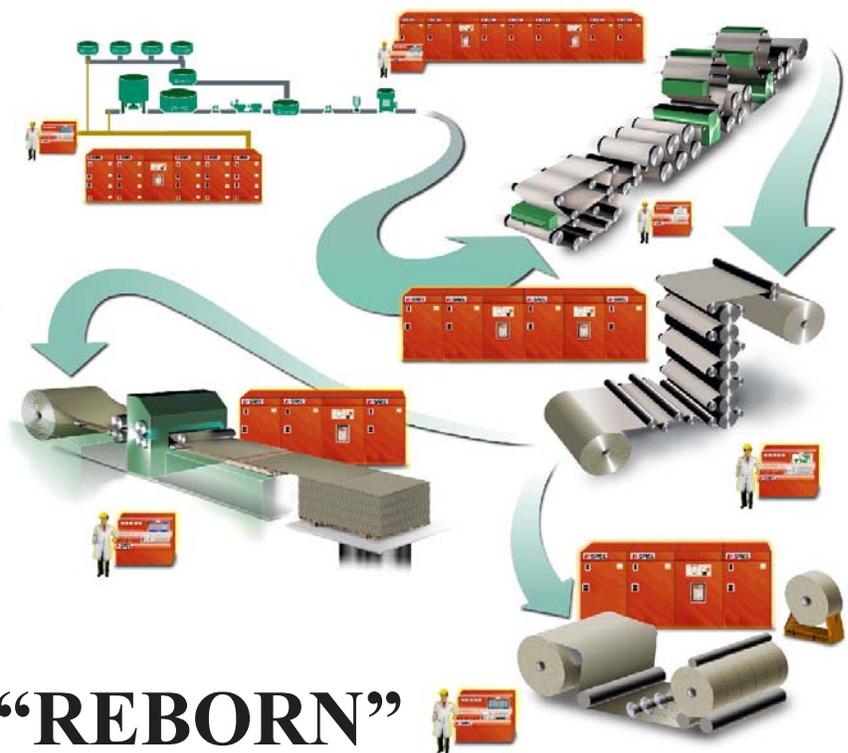
customers and us as activities can be performed directly from our offices. **INTERNET WORLD SAEL ASSISTANCE** is performed without the need for hardware connection, without costly limiting remote assistance systems that use modems and direct telephone connections. Now, we can take over control of our electronic boards in real time, modify the firmware, parameterize the drives, and modify the PLCs from our offices, or from where ever our technical service technicians are. Our customer just needs to connect to our internet site, [www.sael.it](http://www.sael.it), click on the "Internet World SAEL Assistance" link, click on the button to confirm the connection, enter their username and password, and that is it. This connection operation must be repeated after each disconnection. Our technician takes over the station immediately. The technician gives the operator in the plant instructions using the keyboard, or by speaking to them directly in the vocal mode, while the needed changes to the system he is connected to are made. All of this is possible without requiring software be installed on the supervising computer at the plant. If the plant technician does not have the software required for programming the PLC or our drives, we can install and manage these operations from our headquarters using a remote PC as a serial interface with the SAEL hardware. The internet architecture of the system also allows it to be connected the internet at all times, if the customer so requires. In this case, assistance performed by our personnel or the customer's can be managed at any time. Clearly, in this case, a series of passwords and the security system used exclude the possibility to others to connect to it. This solution is extremely useful for remote inspection and remote control. If the machine supervision station is also connected, faults can be viewed, log files can be checked, as well as any other operations it performs. These systems have been up and running for more than five years and are full tested. Since 2005, it is included in all of our systems that have a supervisor. When present, this application has allowed us to reach unbelievable objectives, both on commissioning and for control. All of the customer's drives were reconditioned and all controls were re-digitalized using the REBORN system in three working days, during two



### Scheme to blocks of the tele-assistance I.W.S.A. SAEL

planned shutdowns. Overall, 20 DC motors with 3 MW installed power were reconditioned. The job was organized over three shifts, one for wiring and the other two the electrical testing. About eight people were required for wiring and three for the motor start-up during each shutdown. The system was directly monitored from our offices in Vicenza using the "IWSA", Internet World SAEL Assistance, remote assistance system. In addition to supervising the machine using extremely fast refresh operations, IWSA allowed us to program the

drives, PLCs and to perform all other necessary software adjustments. Our technicians were not required to be on site any days except the three indicated above as we were guaranteed the possibility to intervene directly from our offices on any function that required modification. When the wet section was started-up during the second session, the software expert was not on site; rather, he worked comfortably from his desks with his colleagues performing the normal fine-tuning required during start-up.



# “REBORN”

**THE ONLY INNOVATIVE SYSTEM THAT ALLOWS YOU TO SAVE TO ENVIRONMENTAL IMPACT “ZERO”**