R&D, DEVELOPMENT, FLEXIBILITY AND AFTER SALES. THOSE ARE THE ELEMENTS OF THE SAEL SHARE GAIN OVER THE LAST TWELVE YEARS OF ACTIVITY.
PAPER MILL DRIVES AS MUCH AS TRANSFORMATION PLANTS AWARDED SAEL AS A 360° SKILLED COMPANY ON PAPER INDUSTRY. TODAY SAEL OFFERS HI-TECH SOLUTIONS BEING THE BEST AUTOMATION PARTNER FROM THE SMALLEST TRAFO UP TO THE COMPLETE PAPER MILL.

SAEL s.r.l.... the trasformation

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

Over the last 25 years SAEL achieved a strong experience within the Paper Mill industry electronic automation: special plants, production and paper transformation. The engine of this acknowledgment has been the continuous challenge of the customers to create innovative solutions for their specific needs.

Back to the 90's the shearers, the rewinders, the embossers were considered "low tech automation". Few years later the new technology application based on PC and microprocessor systems gave the right value selling to those applications.

From the mechanical management for all the moving part by piston road and PIV regulators - syncro shearers - to the electronic systems and motion transmission to the knifes. The natural evolution brought ourselves to an high-tech rise increasing quality and automation along the way. Today SAEL offers a huge variety of automation: Electronic syncro shearers; fix blade machines; shearers by register cut; Unwinders; Rewinders; Embossers; Coupling lines; etc..).

SAEL equipments are present over many End Customers: from the smallest manufacturer up to the biggest Paper Mill. Over the last 5 years, the key of this success have bee the REBORN system - fit for old equipment revampings -.

The Company internationalization and the continuous learning behaviour allowed to achieve important goals by acquiring jobs for national big groups with world wide subsidiaries and plants - Asian countries mainly -.

However the domestic market SAEL represents the majority of the installations: Marchi, Burgo, Milltex, Reno de Medici, Favini group, Cordenons etc.. Also important are all the other customers/transformers who bought automations.

To be competitive vs. the most famous automation brands, the constant R&D investments have been the key. This allowed to use a mix of components: standard PLC with own "Intelligent Drive".

A simple architecture without own Hardware use - drives apart, where the continuous research developed specific AC and DC controls with own high-tech.

Bielomatik sheter, Burgo Sora, Cutting system REVAMPING

Rebuilding of Teleset, Telebok ed LDS in a VariRoll winder

Within this PLC series - 200 up to 400 - there is a direct Can Bus dialog through a specific Bridge. Without added costs all our AC or DC drives can be linked to the most common PLC. Any regulation settable via PLC can be done by Write/Read words - Servo-diameters; Cascade Refs; Filtering; Multipliers; Cells Regulators; Speed adjusters; Positioners and so on -. The standard output are: 2 x Encoder in; 4 x Analogical out; 4 x Analogical in; 8 x Digital out; 8 x Digital in). They can be configured as a PLC S7 I/O extension. The Drive does the positioning. It is also possible to send out the computing to the PLC using this data to stop the motor at the right position. Every single product was developed to meet any customer needs with less elements in the equipment possible.

Every engineered equipment with those drives uses a standard PLC. Thanks to the common platform developed every drive - whatever AC or DC - has the same regulation board for every size, and it is possible to replace Thyristor

The "Intelligent Drive" control offers a variety of options fit for any specific paper mill application. Within the software there are specific configurable mathematic blocks allowing any motor/motion control.

There are many communication ports - As standard: 2 x Can; 1 x RS232. As Option: all the Field Buses - Those ports allows a fast connectivity the existing DCS systems in the plant.
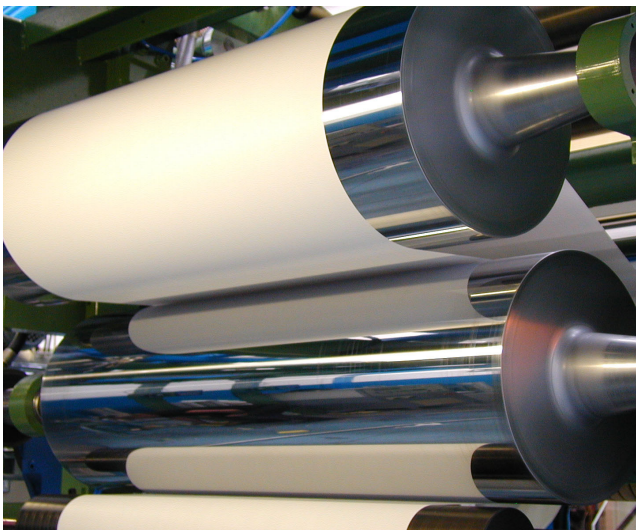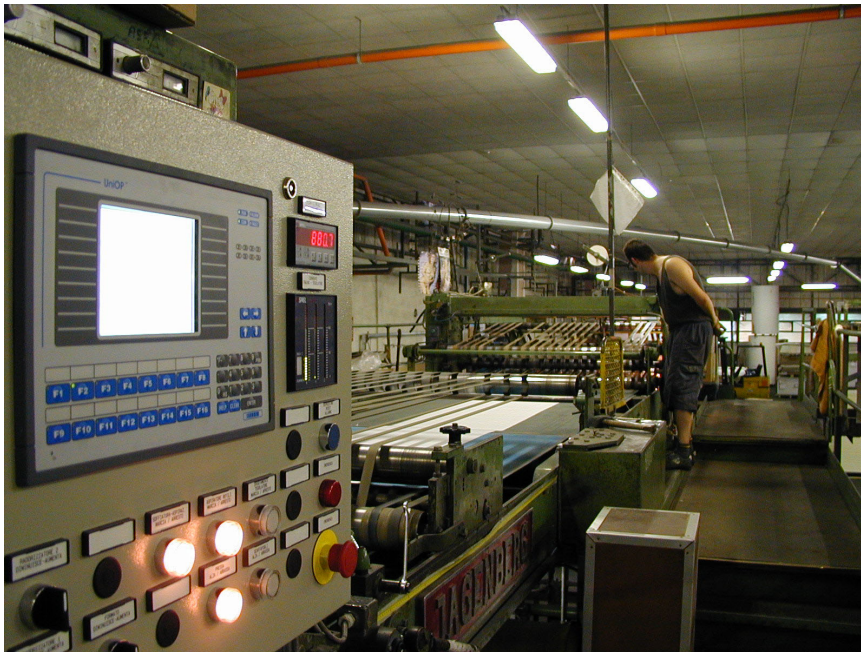
The powerful software "AZWORKER" is the best friendly user Drive tool. It connects all the mathematic blocks getting the desired settings and all the Digital / Analogical on board Drive configurations.

Time after time, application after application, every SAEL AC or DC drive got the historical know-how inside. Today an inverter can drive a simple pump up to the most sophisticated Reel with automatic diameter calculation, inertia compensation with feedback by load cell. A tough and rough, reliable product fit for the Paper Mill environment who well joints the Siemens S7 PLC.

press line and ed cupling

Jagemberg Syncro 1600 Rebuilding, Burgo

Rebuilding of N°2 sheters Jagemberg, IB Italcart.

or IGBT. A SAEL spare part means one board, a branch of thyrostor or IGBT. The DC installations possible are above 1 MW and the AC above 800 kW.

The SAEL "CUT SYSTEM":

Our paper shearers cut system today is the evolution of more than 30 years experience. From the very beginning based on solid state electronic board - cmos, dac and counters - up to the latest microprocessors of today - 64 bit RISC based -.

Over the years many cut systems have been developed across the paper and steel industry achieving the best solution possible for any customer needs today.

The algorithms have a double regulation loop, one virtual loop and one closing loop. To any Brushless motor-drive, Inverter or DC drive, this solution is the best flexible and suitable ever.

This is why we can apply our cut cam to the old equipments using the existing drives and motors without dismantling the cabinets. The blade regulation is driven by the own DCS - Digital Cut System -, a microprocessor who computes the stand alone algorithm in the presence of non SAEL drives only. In case of SAEL "Intelligent Drive", the algorithm is embedded within the

Inverter or the DC drive who processes and manages the motor speed and current loop.

There are many regulation options: from the basic blade up to the sophisticated "scissor" mainly used for steel applications - over the cutting and along the blade angling, the system maintains a constant periphery speed suitable to any variation caused by the blades it selves -.

The recovering profile is generated on time or space base. To simplify please get the "Time" or the "Space" as the "Recovering Profile". This profile could be trapezoidal or triangular as a function of the acceleration or axes speed step increase. The picture 1 is the Recovering Profile in case of electrical axes. The Recovering Profile gets over in case of positive master speed meeting with the settled time only. In case the master keeps inverted the Profile automatically compensates by consequence. It is given that the Profile restarts to exceed the recovering starting quote when the master backs to the original direction.

It is possible to enable the Recovering Profile generation by a "sin2 fnc" ramp: this gets a smooth recover with the average acceleration made on a linear mode, but with 20% exceeding peak over the mid point of the ramp.

As mentioned above the Recovering Profile could be trapezoidal or triangular as a function of the acceleration or axes speed step increase control option. According to the own logic there are four combinations available. Having this system many applications are possible: cut, press, hot press, embossing. Somehow it is possible to reach the double of the original production.
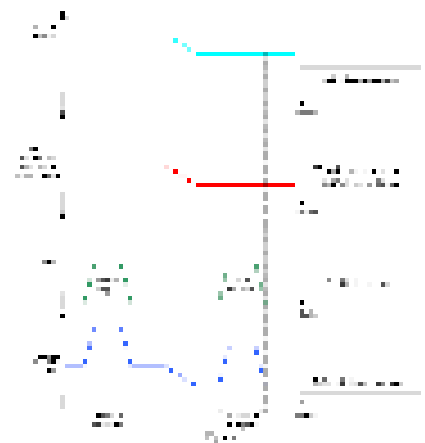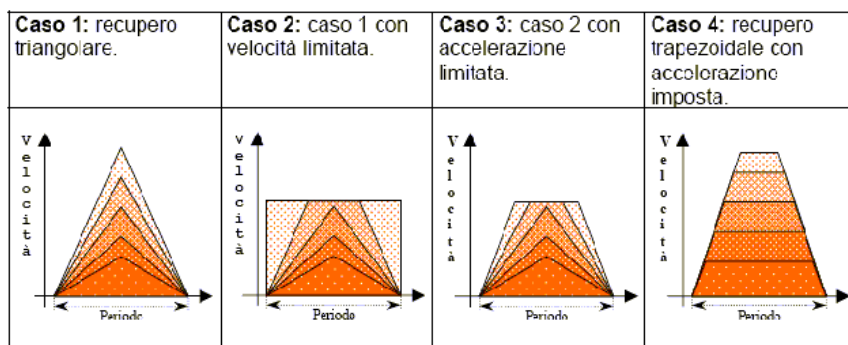
Example of paper print or polyethylene film:

After printing cycle on, there are five phases as following:

1. Print starting phase - the slave and the master speed are the same at the touch point.
2. Intermediate printing phase - the slave and the master speed are the same at the touch point.
3. Ending of the printing phase - the slave and the master speed are the same at the touch point.
4. Slave recovering position phase - - the slave and the master speed are different
5. Next printing phase - - the slave and the master speed are the same at the touch point.

Scusa Paolo: Nel testo in italiano, nelle fasi 1-2-3 e 5, dici che "la velocità dello slave nel punto di contatto è uguale a quella del master". E' giusto che sia così per tutte e 5 le fasi?
Se è giusto, allora non ti preoccupare poiché ho tradotto pedissequamente.

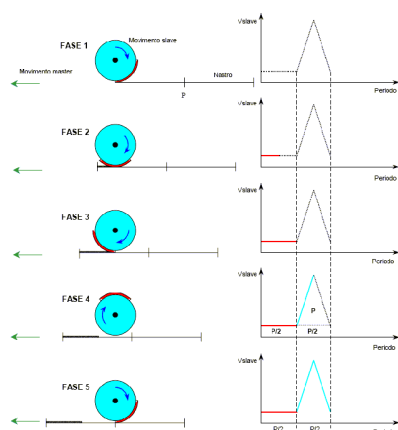| Caso 1: recupero triangolare.	Caso 2: caso 1 con velocità limitata.	Caso 3: caso 2 con accelerazione limitata.	Caso 4: recupero trapezoidale con accelerazione imposta.

NOTA

L'area di ogni shape rappresenta l'entità di spazio slave da recuperare

In caso contrario dammi la nuova versione che te la traduco.

In case of phase nr. 4 the electrical axes recovery must be applied. It is the recovering space needed to meet the synchronization of the following print, equal to "P" - (3/2 P - 1/2 P where 1/2 P is the space of the electrical axes). Moreover to a perfect synchronization the recovery must be done "on Space" with a saving period equal to P/2: the recovering start must be triggered over the master axes P/2 exceeding. This means that the recovering can be done on phase 2 and 3 as well. Important is to set the trigger quote of the recovering start before.

The SAEL "REWINDING SYSTEM":

Through a SAEL Supervisor based on a PC - suitable for trend measurement, hardness curves, etc. - in combination with a S7 PLC, it is possible to manage the hardness curves and Rewinder the operational. The S7 PLC is mainly focused on the sequences management.

The communication between the PLC and the drives is Profibus based as much as CAN BUS for the drives. The interaction of the two communication nets allows a safe and fast data exchange for the motor load management. This is a distinctive key for SAEL application:

The drives set the coil hardness by an own curve without PLC calculation overloading. So the system computes all the motor speed and current refs through the interaction of the PLC and the "Intelligent Drive Sael". Two DC motors are used to set the hardness of the main cylinders over the rewinding phase. The entering cylinder motor drive (rear) is the Master and gives the machine speed. The out cylinder motor drive (front) is the Slave and it is controlled by a torque loop. The coil hardness is given by the two motor torque difference. By a position transducer - existing potentiometer on the rider roll - the coil diameter is detected. Through interpolation points and computing in the Drive, the coil

Calander in Burgo Papermill, Toscolano

Tissue Winder A.Celli in Georgia Pacific Papermills

hardness is given for the starting and the ending phase.

The two motors current control automatically gives the use within the operating range. The ride roll - every Vari-Dur is equipped by - has and own lightning curve managed by the PLC and settled by a video-keyboard. The system encloses: "Rewinding Dimater Stop" with a programmable meter counter by video-keyboard; "Speed Decreasing" for the ending coil; "Meter od Diameter Stop selection" by video-keyboard; "Machine Alarm" by video-keyboard; "Unwinder Breaking" for the unwinder with inertias and diameter calculation; "Cell or Dandy Roll" management by 0-10 V analogical signal; "Reel" release potentiometer from 0 to 100%.

The Rewinder Drum Motors releases are: Speed ref with ramp for the Reel management without external feelers; Rewinder Motor Torque for coil hardness and diameter fnc; Ride Roll pressure computing and servo-valve actuation.

The coil hardness and the Ride Roll curves regulations are settled via supervisor or video-keyboard and adjustable at any time for the flexible system ever.

The SAEL "REEL SYSTEM":

All the Reel electronic computing and the regulations are a specific topic within the SAEL "Intelligent Drive" architecture. By the Drive electronic board is possible to set all the algorithms for the Reel management as much as the speed ref and driving settings.

All the Drives have a software release who reaches +/- 3% accuracy also in case of dramatic line speed variation without any load cell use. The Software has the following features:

- · Diameter computing
- · 2nd derived computing for inertia compensations
- · Machine inertia computing
- · Coil inertia computing
- · Grazing Friction computing
- · Speed Refs generation
- · Video-keyboard and visualizer communication and set-up parameters.

Within the last software release a new macro routine has been upgraded. This allows the indirect reel calculation main data auto-tuning.

The system operator has a huge advantage of that, because any specific skills are required.

Rebuilding of SDW winder in Villorba papermill, Burgo Group