THE NEW PAPER MILL MANAGEMENT APPLIED AT RENO DE MEDICI GROUP

"READI" Industry 4.0 SAEL & COELME System Data Collection, Processing, Archiving.....

Production Reports, raw materials, bobbins, winder and sheeter production cycles, steam, energy, gas, and so many other crucial parameters... Most of the time, these important variables being collected for cost controlling and management repoprting, are processed in a semi-automatic or in a manual way, or most frequently using different software and other tools. But how to avoid transcription errors, computing, as well as getting all the data faster, easier and in a more smarter and reliable way from the local working stations? How to get back to the main software used?

Sael automation electronic systems

Reno de Medici Group

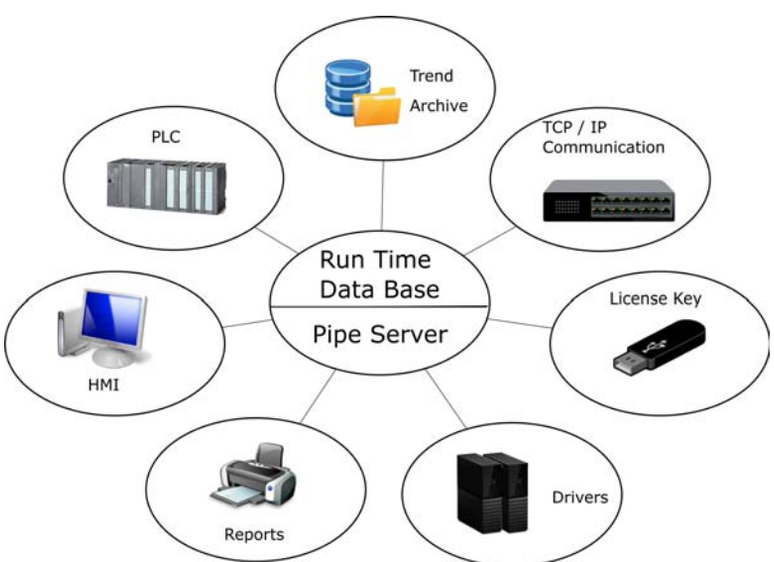
by: **Paolo Andrighetti SAEL**

All started from a simple conversation between us and the engineers in Santa Giustina, at Reno De Medici factory – Eng. Scaglioni, Turati, Cetta and Marcer -. During the meeting they expressed the need to collect all the data from the operating machines in the plant, fulfilling the Industry 4.0 and ISO 50001 prescriptions. Thanks to the basics of our Scalink® system, made to join different platforms in a multitasking way, the challenge was deliverable – For some applications like Turbogas GE BURGO, we had to develop not conventional but specific customized communication protocols (driver). Several PLC and DCS of the plant-including sheeters mainly-were connected to the system through an operator friendly interface, allowing the paper mill to acquire all the data from different machines. Scalink® SW architecture shows its potentials by fulfilling, and providing, all the information required to the ERP plant platform,stepping up the entire system, enabling all the analysis and calculations. Initially, this system, was tested and positively applied in Magenta for data collection from 3 MILLTEX Sheeters, in collaboration with Eng. Natalino Turati. Consequently it was gradually installed in many Reno De Medici plants with several steps related to the different protocols used (owned-

office PLC-DCS-HW).

Our Scalink® platform, made for paper mills' systems networking, without specific I/Os, was eventually the best choice for the customer. Based on a SCADA philosophy, easy to program and practice, Scalink® can be totally integrated to the Windows system, exploiting all the potentials arising from communication among native office stations. The real challenge is, and will be, to facilitate operators by providing them one simple tool versus all the rest different ones which they use today. Even though Scalink® is a customized solution for multiple and specific needs of each paper mill, it is not suitable as a system BRIDGE only, but as a global management platform, as well.

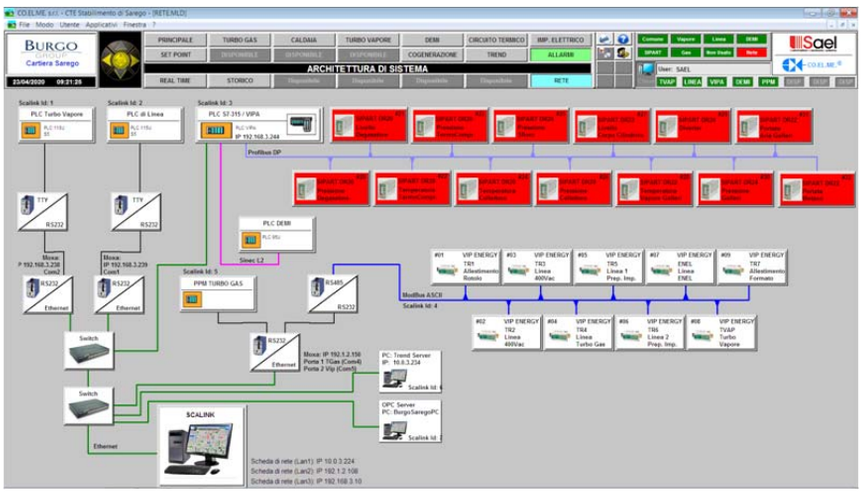
Any single value even of a relatively larger scale size can be stored, historicized, and showed in a report way, independently to the original source – all related to the Hard Dick capability, of course -. Every variable can be treated by Excel or Access Windows programs, and resubmitted as a new variable after the calculation (production specific, energetics, etc.). This is why our Scalink® system has no barriers, computation wise.



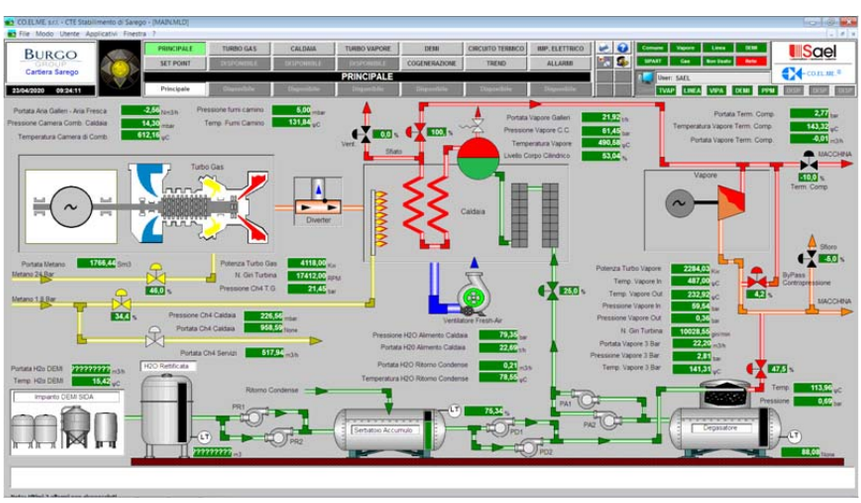
Scalink is not only a scada, the platform is born for LEVEL1

Export-preparation-configuration-data analysis:

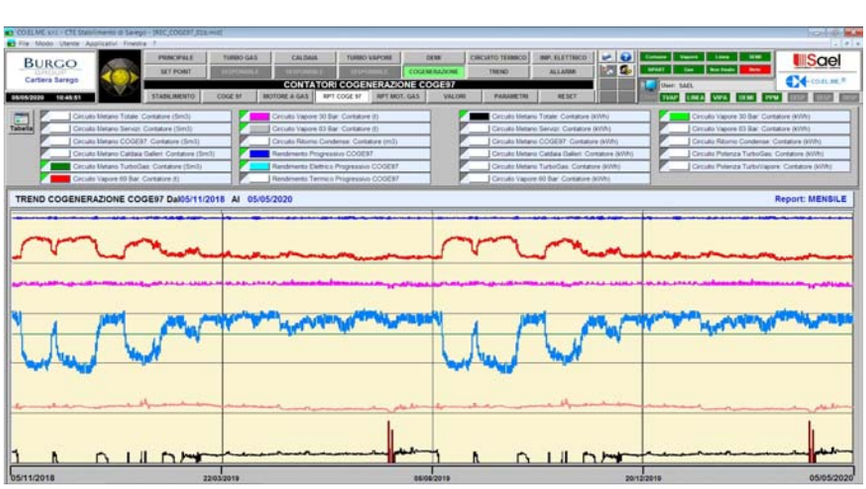
READI-data mining-Scalink



Above an example of data exchange and communication of the Scalink system to different participants of a network, and, below, the assembly page created for the thermal and energy center of which the network above



Below: reports that can be made for selecting the desired quantities from date to date, each single variable or group of variables can be exported to the table.



Which is the paper mill industry future?

The new upcoming frontier is the so-called "Big Data Analysis" providing a useful tool both to Top Management and to other managerial stuff, needed according to the strategic goal setting of each mill. Within the few following years, all the production processes will be digitalized. Industry 4.0 won't be a target to achieve, but a more of a new way of making business and manage companies. This is exactly the "Big Data" frontier. All those huge amounts of data, managed by an A.I., and applied to a predictive analysis in real time, will be the basics for a smart maintenance program, as well as a better/efficient products engineering: efficiency and cost effects; in other words. There is no doubt that data will play a strategic role in the modern industry, since they are becoming larger size & amount wise and of different characteristics, such as:

1.Design data : data regarding designing machinery and products.
2.Operation data : in relation with the equipment functionality and their components, as well.
3.Efficiency of labor data.
4.Costs data.
5.Logistics data.
6.Environmental and climatic conditions (internal/external temperature, humidity, noise) data.
7.Fault and system health monitoring data.
8.Quality product data (% of defective production).
9.Product's life cycle data (reparation, warehouse availability).
10.Customers data (Market Targets, feedback from product usage, design suggestions).

Thanks to the Data Mining (the decision maker information) it is possible to understand if there are some engineering errors; machines and components life cycles;

production faults or mistakes; efficiency; job monitoring; customers preferences and needs, and so on. Starting from these real time information, the Companies can go far beyond the simple manufacturing **process**: they can aim to the global service.

Case History – READI System

(acronyms related to the Italian words: Collection, Processing and Factory Data Storage)

Reno De Medici Group

Introduction and Customer targets

The READI system (Collection, Processing and FactoryData Storage) was implemented collecting the different needs at the time of Reno De Medici operators. The targets were defined during several meetings, benchmarking and other activities; the consequent actions, planned in different steps and scheduling. Every Plant of the Group is independent and manages its priorities defined by their Strat Plan. The main points chronological overviewed, were:

- Industry 4.0;
- ISO 50001 Certification;
- Big Data Analisys (final costs);

In order to meet the customer expectations, the system was built in different steps at the four Plants involved in the project: Santa Giustina (Belluno – TV), Ovaro (Udine - UD), Villa Santa Lucia (Frosinone – FR) and at the Sheet Centre in Garbagnate Milanese (Milano – MI)

Industry 4.0 and DATA MINING

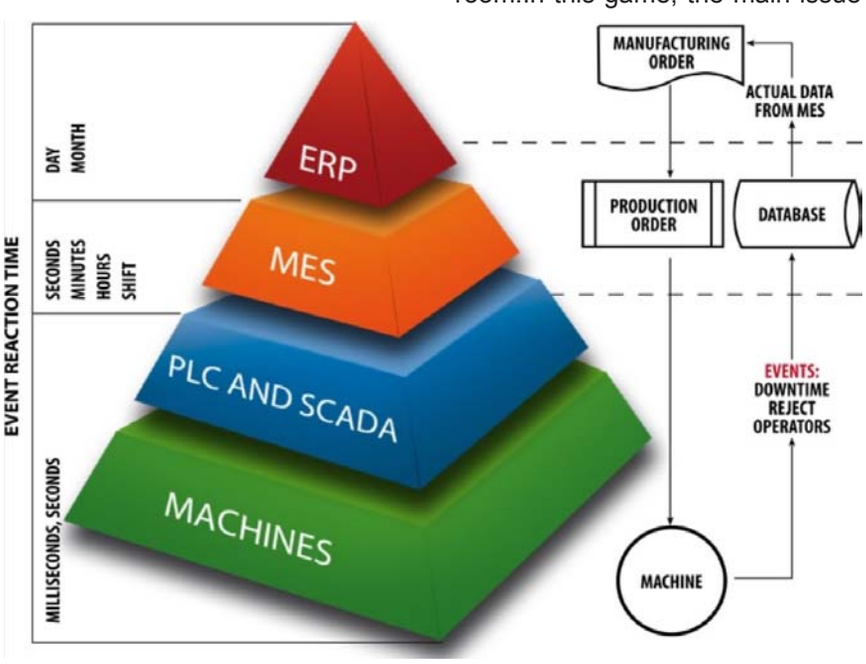
The Industry 4.0 actions target, is the Plant networking data interconnection and exchange between the local hubs (the machines) and the management system itself: Among Its mandatory aspects are the following ones: process control by PLC; bi-directional data exchange between the main system and the single machines in a standard way; a friendly user human interface, easy to drive; safety of the duty cycle and operators safety as well. In other words, the Ethernet TCP/IP protocol communication networking is highly recommended – either copper or fiber, privileging the OPC or Modbus TCP protocol whenever possible -.

ISO 50001 Certification

The above mentioned ISO, norms the requirements of creating, starting-up and maintaining an energy management system. As Ultimate goal achievement is regarded the "continuous organization improvement" as well as overall efficiency enhancement. In other words, it is mandatory to measure, storage and treat all the energy related data, as much as the efficiency indicators.

BIG DATA ANALISYS (Final Costs)

The interesting aspect of this analysis is the big data archive building: many pieces of a single information, together, "free of charge in a room". By filtering and working on those data, the user can get almost all the inputs, highlights and information needed to drive its own business or daily task. All the information, from energy consumptions to manufacturing data, are available in one single room.In this game, the main issue



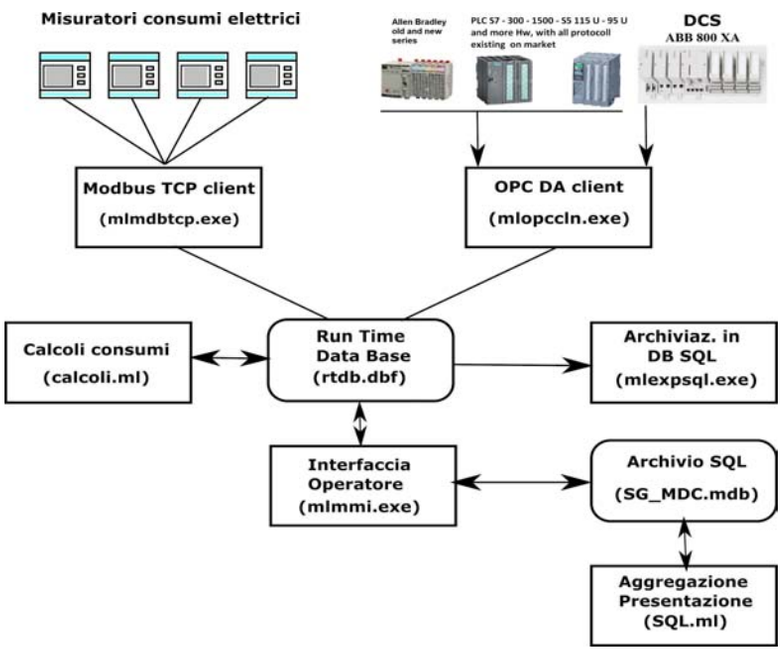
Functional business model of reference for our "READI"

is the big data management as well as the exchange with different SW platforms and specific analisys package.

Realization of the READI System

READI is based on the standard Scalink® SCADA software. The reason is because we wanted to fulfil many customer needs using a common base in terms of uniformity. A base without specific individual development, bringing a lot of benefits in terms of savings. Moreover, the Scalink® package is well suited to this task because:

- It has a modular structure, that permits the activation of all the interfaces in a simple way.
- It Is highly scalable, allowing to set up both the station with a few dozen signals and the central one with thousands of signals.
- Since 1996 was made with a client/server architecture, permitting the detailed distribution of the infrastructure when necessary.
- It Is equipped almost with every widespread protocol* and data exchange standard, used in industrial sector.
- It has a data storage with refresh rate per second and an extremely efficient data compression.
- It allows the data presentation and curves in a graphic and tabular mode.



The detailed diagram above shows the various Scalink® modules involved in the processing: at the level of script procedures, summary calculations of the users or validation of the signals were made when not already available in a "rough" way from the field.

- It is equipped with an interpreted script language, in order to carry out locally additional calculations, where and if necessary.

INDUSTRY 4.0 Solution

The first solution was based on a Scalink® source placed in every Site. This had a data collector function for all the operating machines in the Plant. The first achievement was to get a unified OPC interface, regardless of the connected device: a unique front end for each Plant and Supplier who lets Scalink® the local protocol management. This first solution with a single Computer serving all the Plant, evolved into a distributed architecture where every machine has an own Scalink® workstation linked to the main Scalink® One.

At Reno De Medici Ovaro and Santa Giustina, the OPC DA data exchange Scalink® Concentrator Unit was linked to the ABB 800XA DCS of the Continuous Machine, and the Siemens S7-1500 / S7-300Simatic, installed in the automatic packaging line (AGV) as well as the Ovaro Winder. This Scalink® tool exchanges data with the AS400 system via OPC UA. The plant of Villa Santa Lucia is on the way to renew their ABB DCS system: the connection between the DCS and our Scalink® will be done as soon as the update operations will be ended. In the meanwhile, we connected the new Winder machine with the Siemens Simatic S7-400 and the AS400 by the Scalink® Concentrator Unit, using an OPC protocol. At the Sheet Centre of Garbagnate Milanese an OPC DA protocol is used to connect the new

MILLTEX-SAEL with S7-1500 Siemens and our Scalink® Concentrator Unit, as much as the OPC UA is related to the IT Plant system. Starting from the Industry 4.0 solution, the Santa Giustina Paper Mill, built an Ethernet network along the Plant conforming the joining of the energy measuring. The link to the DCS was formerly made, and it was enough to add new signals to the list, only. Using a standard SCADA – which is a basis of our Scalink® - we achieved a multiple result by a single interface/position.

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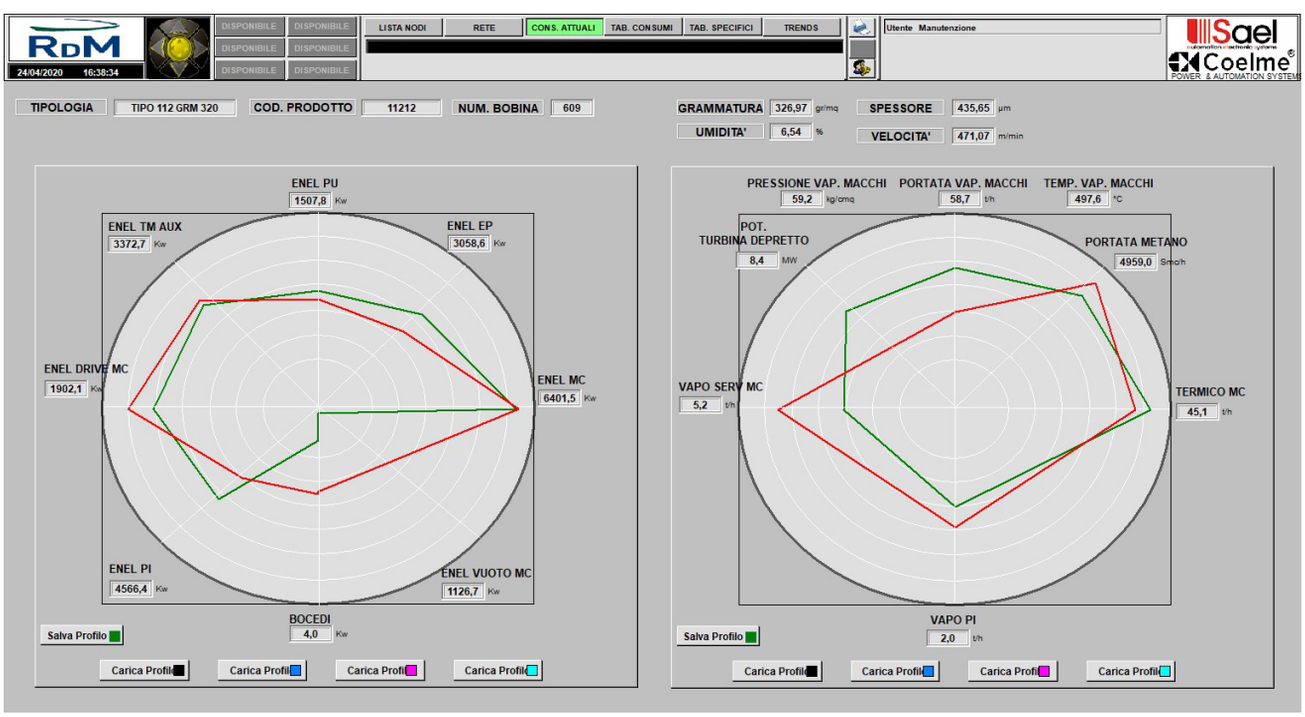
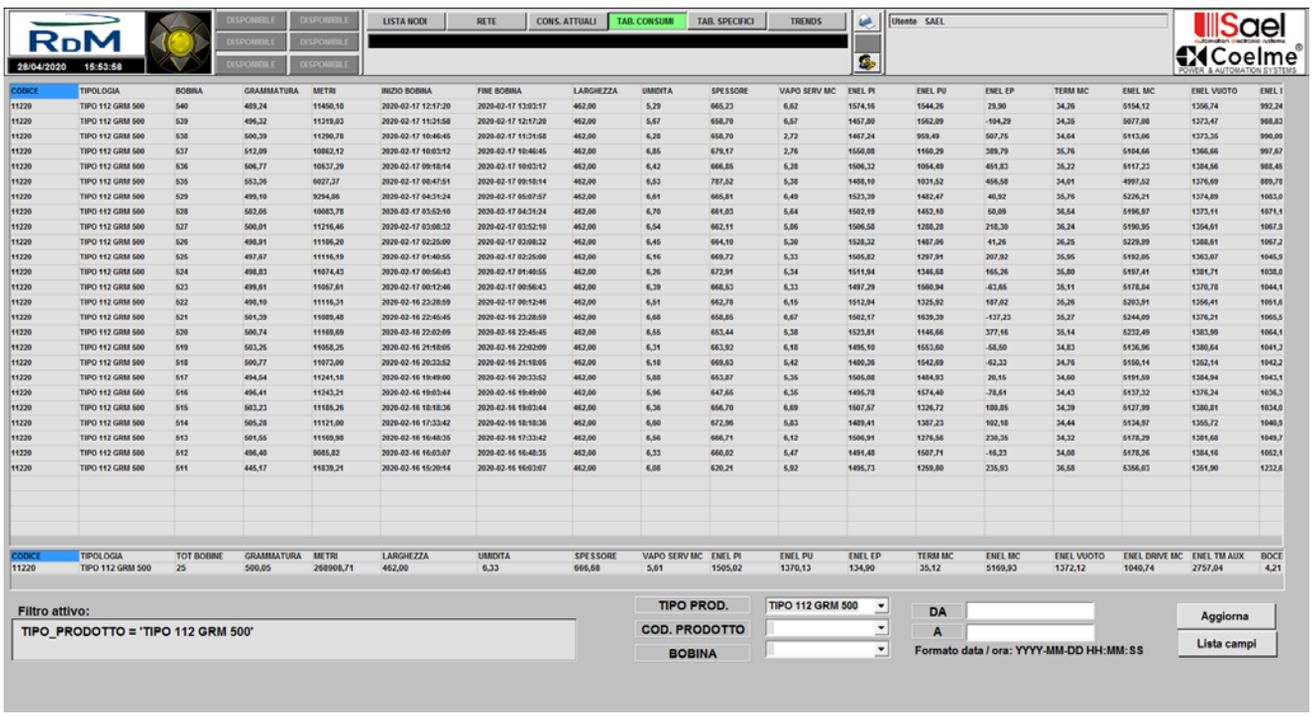
the goal

Allow the production operator in real time to verify that the consumptions were within the reference ones: graphically the vertices of the current polygon (in green) must remain within the reference one (in red).



An interesting Polygonal tool which detects and auto records the machine consumption, was added to provide quick and dynamic parameters in term of energy trend. This is placed on few specific pages in the Scalink® SERVER Unit. Whenever the production re-starts, the system guides the energy saving research, showing any deviation of the actual versus the benchmark. This tool allows fine adjustments, optimizing * consumptions.

View historical data in tabular format for use in production management.



Moreover to the Polygon operator usage, our READI system met the Management expectationsin order to have a detailed energy report. Thanks to the data cross matching coming from many PLC, DCS and the AS400 management system, plenty of info per each roll could be available and easily accessed, such as: Rool code; type of paper (e.g. 210gr or 400gr”); serial reel number, grammage, meters, starting date, ending date, length, humidity, thickness, data in-a-row, etc. On top of all, any “absolute” energy – mandatory – parameter: from the Steam to the Electrical energy per section (MC kW Drive, not load kW, purge kW, stock preparation kW, pulpers kW, machine head kW, auxiliary kW, stock preparation steam, MC steam, services steam, etc.). To control every single production, all these data are supported by a fast and simple search engine which can be filtered by product code, manufacturing time line or other filters.

DCS FAMILY

ABB 800 M -XA

ELSAG BAILEY

HONEYWELL

METSO/VALMET

AND MORE

SIEMENS
WHOLE FAMILY

S5 - RG AND 115 -100 - 95

S7 300 - 400

S7 1500

OPC UA SEVER-CLIENT
OPC DA SERVER-CLIENT
MODBUS TCP SERVER-CLIENT
ETHERNET PLC SIEMENS S7
RS 485
RS 422
MODBUS RTU-ASCII
SNMP

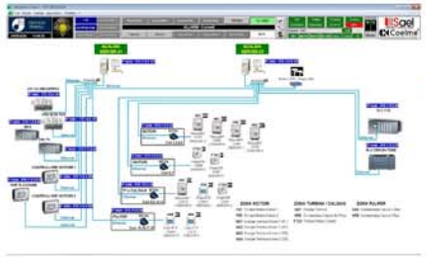
API AVAILABLE FOR DRIVER DEVELOPMENT

SQL INTERFACE

IEC 61850
IEC 60870-5-104
IEC 62056-21-C (IEC 61107)
SIEMENS AG LINE S5
SIEMENS 3964R

ALLEN BRADLEY
WHOLE FAMILY

GE -VIPA- YASKAWA
WHOLE FAMILY



THERE ARE NO LIMITS FOR HARDWARE BRAND

AND KIND OF COMUNICATIONS:

WE ARE ABLE TO DEVELOP THE PROPER DRIVER

OFFICE PC inside the Papermill

Any computer in Intranet can be CLIENT for
TWO HOURS, FREE without any SW installation

SERVER 2

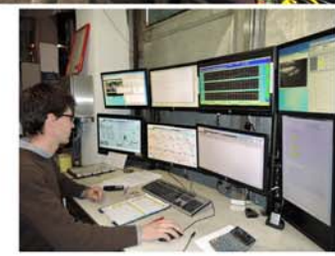
AUTOMATIC REDONDANCY DATA RECOVERY

CLIENT

ILIMITATE NUMBER

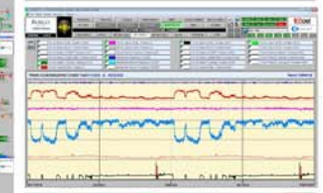
SERVER SCALINK - L1 to L4 SCADA

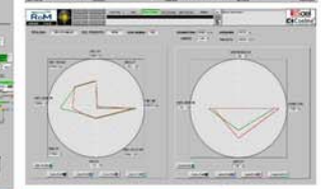
EXAMPLE OF CONTROL ROOM



ENERGY SURVEY

DATA FROM DRIVES





DATA ANALYSIS

PLANT SUPERVISORY
PRODUCTION CONTROL
PRODUCTION REPORTING
TREND COMPARISON
BIG DATA COLLECTION
DATA PROCESSING
DATA MINING
MODEL ELABORATION
OPTIMIZATION CAPABILITY
ELABORATION BY OFFICE SUITES
BRIDGE THROUGH DIFFERENT SYSTEMS
SCADA FROM L1 TO L4

DATA FROM STOCK-APPROACH

DATA FROM THERMAL POWER PLANT