BDF INDUSTRIES' EFFICIENCY IMPROVEMENT PHILOSOPHY

The history case presented in this document aims at showing how to obtain technical and economical benefits through a simple efficiency improvement intervention in the utilization of the 3.5 bar air compressors room.

Nowadays the concept of "Efficiency To Survive" must be more than ever conceived and applied with intelligence and simplicity, and integrated in the existing conditions of the plant. As a consequence, any part of the glass factory may aspire to higher efficiency levels, and any process to be improved.

Thanks to the experience gained in several fields of the glass making process (batch management, furnaces, forehearths, IS machines, energy recovery systems), BDF Industries Group has developed its own philosophy which focuses on streamlining activities in every part of the plant.

Everything starts from the assumption that, within a glass factory, there are a number of key factors that define which are the main costs weighting on production:

- cost of raw materials
- cost of energy
- cost of equipment
- cost of human resources

ENERGY SAVING

BDF Industries has been proposing solutions in line with this philosophy for years, starting with the AFE function (Active Front End) applied on the inverter operating movement of its IS machines, up to proposals for waste heat energy recovery, based on the use of the ORC technology, to the management of waste water treatment.

COMPRESSOR CONTROL SYSTEM – CASE HISTORY

The case history presented below has originated from the need for optimization proposed by one of our customers on an important utilities department of his plant, already monitored by a BDF SCADA control and monitoring system dealing with data monitoring and consumption information on fuel, electricity, water, lighting system and 3.5 bar air compressors.

The 3.5 bar air compressor Department was equipped with compressors of 3 different brands and models which, despite having their own centralized control system, provided utility air independently from the real load required.

The 3.5 bar compressed air compressors reach their maximal efficiency when the pressure/flow report is within the limits set by the manufacturer. Due to the parallel connection of multiple machines - non identical machines - each compressor adapts itself to the working line conditions on a non-optimal curve points.

Under these circumstances it may happen that a compressor works at 100% of its potential while the others at a completely different value; the excess air produced cannot be absorbed by the line and must therefore be discharged in the atmosphere with great waste of energy.

The working situation of our case showed two fully loaded compressors and one working at 50% of its load capacity. No optimization or working hour calculation on the individual machines was executed.

We have proposed and implemented a BDF compressors control system, based on Master/Slave control technology, which, through the introduction of a PLC with an appropriate algorithm, has allowed to harmonically adjust compressors batteries and to keep a constant pressure in the manifold, regardless of load variations.

Besides bringing a significant reduction of electricity consumption within the Department and an improvement of the operating characteristics of the machine group, this operation has also favoured a dramatic reduction of maintenance costs. The compressors work following an homogeneous pressure set-point which reflects the users real compressed air demand.

In addition, ingress and working time of each compressor are calculated and stored by the control algorithm, thus extending the machine life.

Our solution is applicable to any compressor brand and model, and enables an extremely fast return of the investment.

BDF compressors control system (which is applicable both to PLC controlled and to electro-pneumatically driven machines) consists of a new PLC connected to junction boxes installed nearby to the existing compressors framework. The junction boxes contain the equipment for the automatic management of intake and exhaust valves.

The valves may be controlled via switch, both by the existing PLC and by the new one which manages the intake and exhaust air valves in order to optimize compressors working and reduce electricity consumption.

The valves can be supervised either by the machine PLC or by the new compressors PLC, through two 4-20 mA signals. Two position transmitters are installed for each compressor on the electro-pneumatic actuators of the suction and discharge valves, with output signal 4-20mA.
The position transmitter to be installed must be defined in the execution phase depending on the compressors actuators.
All signals for the automatic capacity control system of compressors are brought under PLC control.

Also downstream of the compressors, a pressure transmitter connected to the new framework is installed on the 3.5 bar air manifold, in order to perform the compressor calibration PID on the 3.5 bar air circuit. The system is managed by the operator panel or through the integration in the existing SCADA supervision system.

The final results of the application of the BDF compressors control system are extremely positive: the machines workload optimization achieve a 60% of capacity, gaining a 30% saving on electrical consumption costs and a 20% saving on maintenance costs.