

OraStream™ automatic vacuum valves: advanced control for effective and stable sheet formation

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INTRODUCTION:

The OraStream™ automatic vacuum valve represents a new generation of vacuum regulation systems designed for high performance paper machines. Developed to ensure stable vacuum levels, fast response and minimal maintenance, the valve integrates a simplified mechanical layout with an optimized flow path that reduces clogging and ensures long term reliability even in demanding wet end environments.



Image 1: *Cartiere di Guarcino manufacturing plant is a specialty paper mill located in Guarcino, Italy.*

The engineering behind OraStream™

OraStream™ design focuses on three core principles:

- high performance with reduced mechanical complexity: the internal geometry minimizes pressure losses and prevents fiber accumulation, while the actuator delivers rapid and repeatable modulation of vacuum levels
- precise and dynamic vacuum regulation: the automated control system ensures stable set points even under fluctuating flow conditions, improving process repeatability and sheet uniformity
- full interchangeability with existing valves: OraStream™ is available in two way and three way configurations and can replace traditional valves without structural modifications to the vacuum line, software control or machine frame

The combination of these features has led to widespread adoption across multiple paper mills, particularly where vacuum stability and maintenance reduction are strategic priorities.

Technical case study: Cartiere di Guarcino – MC1 DuoFlow System

Initial conditions and identified issues

On the MC1 at Cartiere di Guarcino, the existing medium vacuum valves installed downstream of the dandy roll exhibited several operational limitations:

- unstable vacuum levels during transient conditions
- mechanical sticking due to fiber and fines accumulation
- limited precision in modulating vacuum across the DuoFlow chambers
- frequent manual interventions and unplanned maintenance stops

These issues directly affected sheet formation quality, drainage uniformity and overall machine efficiency.

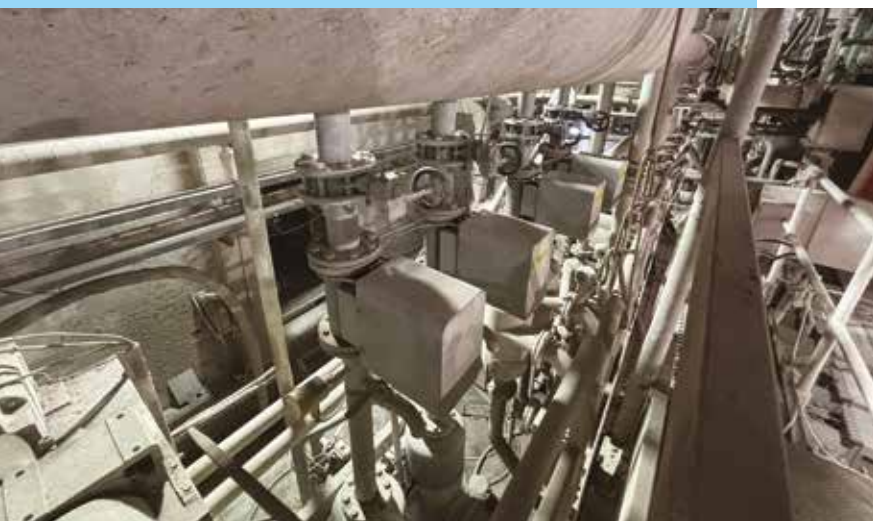


Image 2: The four automatic OraStream valves installed.

Oradoc Intervention

Oradoc installed four OraStream™ valves on the DuoFlow boxes located after the dandy roll. The objective was to enable independent and fine tuned control of the four vacuum chambers, optimizing:

- early stage drainage
- sheet formation uniformity
- vacuum stability under variable load
- system responsiveness during grade changes

The integration required no structural modifications thanks to the plug and play compatibility of the OraStream™ design.

Measured technical improvements

Post installation analysis highlighted several quantifiable benefits:

- significant reduction in vacuum oscillations, improving process stability
- enhanced drainage efficiency in the initial forming zone
- more uniform vacuum distribution across the DuoFlow chambers
- elimination of mechanical sticking and reduced risk of occlusions
- lower maintenance frequency and improved uptime
- measurable improvements in sheet consistency and formation quality

The fast response actuator and optimized flow geometry contributed to a more predictable and controllable vacuum profile, supporting higher operational efficiency.

We invited **Eng. Simone Principia, Cartiere di Guarcino's plant manager**, to provide deeper insight into the main points of Oradoc's intervention.

Mr. Principia, as a starting point, we would like to outline the profile of Cartiere di Guarcino to frame the scope and characteristics of its production processes.

Cartiere di Guarcino S.p.A. is a leading Italian producer of high quality decor papers and operates a technologically advanced plant where process stability is essential to meeting the rigorous visual and structural requirements of the furniture and laminate industries.



Image 3: OraStream valve design.

The mill's production relies heavily on precise wet end control, particularly because decor papers contain pigments that demand uniform formation, consistent drainage and stable vacuum conditions. Any fluctuation in these early stages can compromise opacity, printability and surface appearance.

Can you please detail the specific failure modes observed in the previous vacuum valves?

In recent years, the mill began experiencing increasing instability in the vacuum system of PM1, particularly in the low vacuum section downstream of the dandy roll. The existing valves showed progressive performance degradation: deposits caused sticking and clogging, response times became slower and less predictable and vacuum levels fluctuated beyond acceptable tolerances. These issues not only affected sheet formation, but also required frequent maintenance interventions, interrupting production and reducing overall efficiency.

Image 4: OraStream valves after installation.





Image 5: OraStream valves on display.

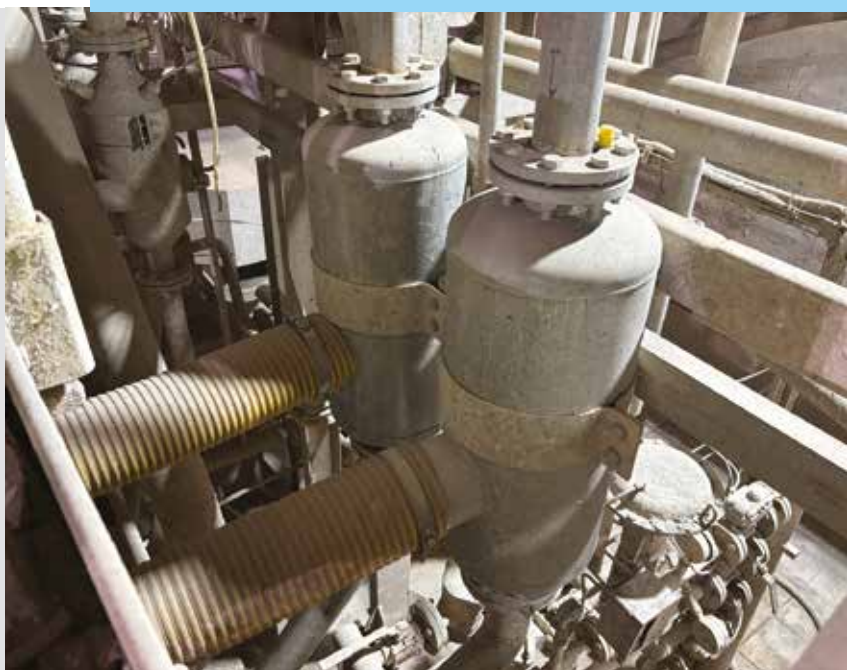


Image 6: New Duoflow separators downstream of the dandy roll.

What were the key technical reasons for selecting Oradoc's OraStream™ solution over alternative technologies?

Cartiere di Guarino evaluated several technological options before selecting Oradoc's OraStream™ automatic vacuum valves. The decision was driven by the simplicity and robustness of the design, which minimizes internal wear points and reduces the risk of clogging. The valves offer high rangeability and precise modulation, allowing operators to maintain stable vacuum levels even during rapid grade changes. Their fast response and high resolution provided the level of control required for decor paper production, while their full mechanical compatibility ensured a smooth installation without modifications to the existing layout.

Which measurable improvements have been observed in terms of sheet formation, drainage efficiency, vacuum stability or energy consumption?

The first installation involved four OraStream™ valves on the DuoFlow boxes of PM1. The impact was immediate: vacuum levels stabilized, drainage became more uniform and sheet formation improved across the entire basis weight range. Operators reported a marked increase in process predictability, with the machine responding more consistently to setpoint changes and varying conditions. The clogging issues that had affected the previous valves disappeared entirely and maintenance needs dropped significantly. The improved control also enhanced operational flexibility, allowing the mill to switch between lightweight print base papers and heavier underlays with greater confidence.

Considering the positive outcome, are there plans to extend the OraStream™ installation to other vacuum circuits or machine sections?

Encouraged by these results, we are now evaluating the extension of OraStream™ technology to the high vacuum section of PM1. The goal is to replicate the stability achieved in the low vacuum area and further optimize dryness, energy consumption and downstream performance.

The success of the first installation has demonstrated that precise vacuum control is not only a technical upgrade but a strategic enabler for consistent quality in one of the most demanding segments of the paper industry.

The results achieved at Cartiere di Guarino confirm the technical effectiveness of OraStream™ in stabilizing vacuum profiles, improving early stage drainage and enhancing sheet formation quality. By eliminating sticking and reducing maintenance frequency, the system has increased overall process reliability and machine uptime. With the evaluation of further installations already underway, OraStream™ has proven to be a robust and scalable solution for advanced vacuum control in high performance papermaking.



Image 7: New Duoflow separators downstream of the dandy roll.