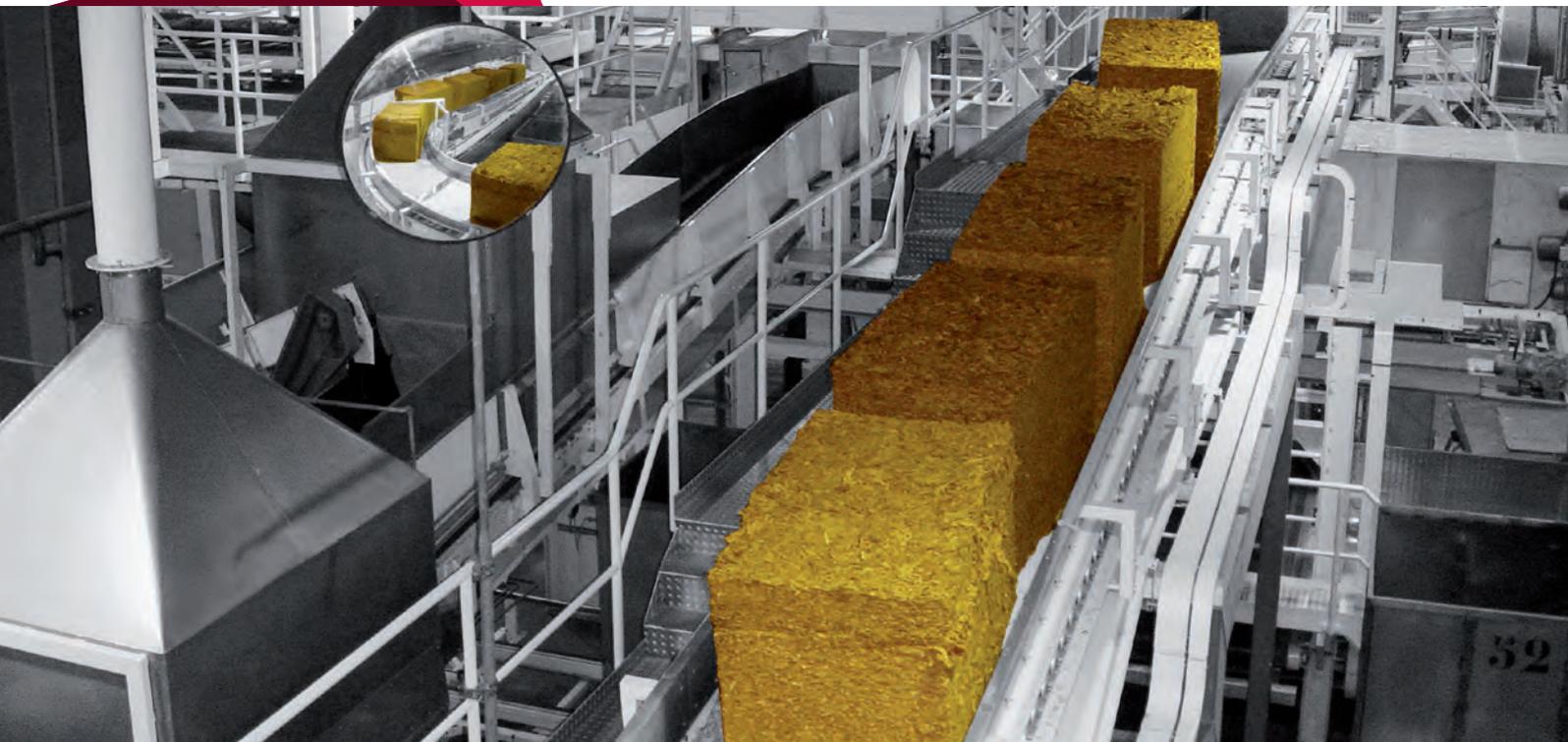


SUSTAINABLE SOLUTIONS



Tobacco



Introduction

JOA was established in 1998 and has grown into an international organization with its headquarters and R&D facilities in Delft, The Netherlands. Regional offices have been set up in the USA and Russia. The background of our company is applied fluid dynamics for high performance dust and vapor extraction systems and micro climates.

Our philosophy

With a detailed understanding of the synergy between the production process and the extraction system, a better solution is guaranteed. Computer modeling provides enhanced capabilities for system optimization and expansion, as process changes demand it. Patented JOA products have become a standard for many multi-national companies in the Tobacco, Plastics and Toner markets. Since 1998, JOA has designed and installed over 450 systems which have provided successful operations and value for our customers.

Sustainable Solutions

JOA is focused on delivering value to our customers by providing long term sustainable solutions, targeting direct ROI for:

- Primary Solutions:
Environmental emissions and 'internal climate' improvement with reduced water and energy consumption.
- Secondary Solutions:
Handling careful tobacco feeding and improving maker uptime, at minimal energy usage.
- Energy Solutions:
Using dryer exhaust streams for direct hot water and steam generation.

In several cases, JOA has developed innovative, customized solutions that achieve multiple goals for the customer.

We look forward to serving your organization, with our teams of specialists in this field.



Gerard de Jager,
CEO JOA Group

PRIMARY SOLUTIONS

Vapor Extraction and Odor Abatement:

JOA provides a range of proven solutions for vapor extraction of Primary equipment and processes. With the growing demand for free steam injection in e.g. DCC's and Casing Cylinders, a standardized concept with an optimized flow profile is applied to minimize fouling. Additionally GCM™ balancing prevents condensation of 'tobacco vapors' in the piping, significantly reducing fouling related maintenance intervals and production stops.



JOA Venturi™ Scrubbers are the most sustainable scrubbing solutions in our industry.

All JOA installations, following our 6Sigma based project methodology, will be delivered with a process guarantee.

To meet (local) environmental legislation, the units are capable of providing:

- Dust removal efficiencies ranging from 96-99.9%.
- Odor abatement efficiencies ranging from: 80-99%.

The proprietary JOA inline-Venturi™ scrubber has been developed for Primary tobacco applications, focusing on reducing water and energy consumption significantly.

This makes the JOA inline-Venturi™ the most sustainable scrubbing solution for Primary exhaust air handling in the industry.

De-Dusting:

GCM™ modeling is applied to flow and pressure balancing of de-dusting systems for Primary and Expanded Tobacco processes. These high capacity, multi-point (e.g. cutters, belt transitions) extraction systems requires optimal filter design to achieve:

- Controlled emissions to the operators at 0.1 MAC level (< 0.5 mg/m³ 8 hrs. average).
- Preventing extraction of valuable tobacco by applying the JOA Deflector™ patented hood concept. Extremely important for ultra-light DIET / ET tobacco.
- Minimize extraction capacity, reducing installation CAPEX and operational cost by minimizing the make-up amount of expensive, conditioned, HVAC air.



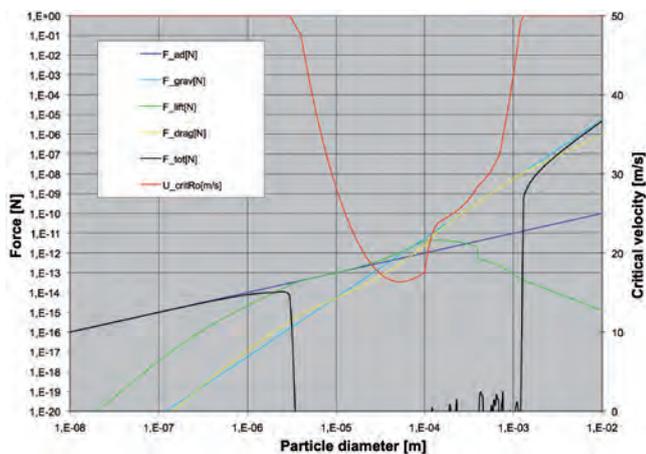
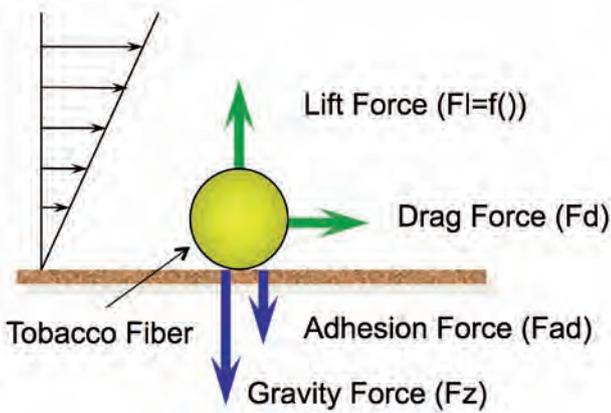
JOA dust removal and odor abatement equipment for medium and high capacity Primaries.

SECONDARY SOLUTIONS

Maker Group Feeding and De-dusting:

The objective of this product line is purely driven by the balance between economics and sustainability. Manufacturing cost is highly dominated by the cost of tobacco. Careful transportation of the high value, fragile, cut filler is essential to maintain high level filling power. Extensive measurement programs have proven two key target areas:

1. Feed-pipe quality (connections, bends, blend selectors) and lay-out, combined with optimized tobacco conveying speed are the essential contributors for minimizing tobacco fiber degradation. Force balance modeling of the tobacco fibers in the viscous sub-layer of the conveying pipe is key to understanding the conveying process and will help to minimize / optimize the conveying velocity (V_{0crit}) without the risk of plugging.



The JOA Forced Balance Flow Control Unit (FBFC-unit) is an innovative solution for handling tobacco feeding carefully.

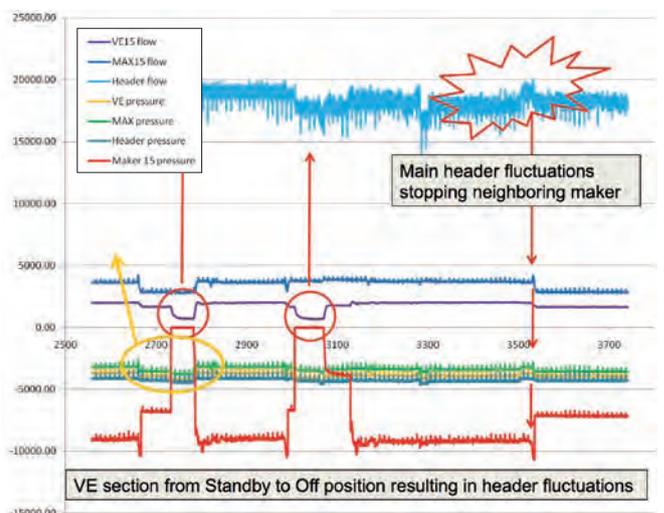


The JOA Carrousel™ minimizes uncontrolled maker stops, by eliminating header pressure fluctuations (see graph below).

2. For increased maker uptime and production flexibility, it is essential to prevent dynamic pressure fluctuations over +/- 150 Pa, in the central maker-group de-dusting header.

To achieve this, the following technology is used:

- Patented Carrousel™ systems, controlling header pressures by compensating for neighboring maker start, stop and stand-by conditions.
- GCM™ pressure- and flow balancing at 1 Pa.
- If possible separation of VE and MAX.
- Additional capability; to compensate for internal maker blower wear.



ENERGY SOLUTIONS

In tobacco plants, energy awareness is high. Reduction of electricity and steam consumption are in particular important factors for meeting the carbon dioxide emission reduction targets at each plant. Processes such as Flash Towers, ESS-units and Cast Leaf Dryers require significant energy. The exhaust gases from these units contain high levels of enthalpy, providing a great opportunity for energy recovery.



JOA ERD™ Scrubber Skid; combining exhaust-gas / steam cleaning with direct hot water or steam generation.

The ERD™ Scrubber Skid is standardized on FTD sizes, and replaces the need for condensers. The ERD™ exists of an exhaust-gas cleaning and heat recovery section. The high efficiency inline-Venturi™ cleans the exhaust stream with 30% less energy consumption than classic scrubbing solutions. The recovered energy ranges between 0.5 and 2.8 MW and is used for:

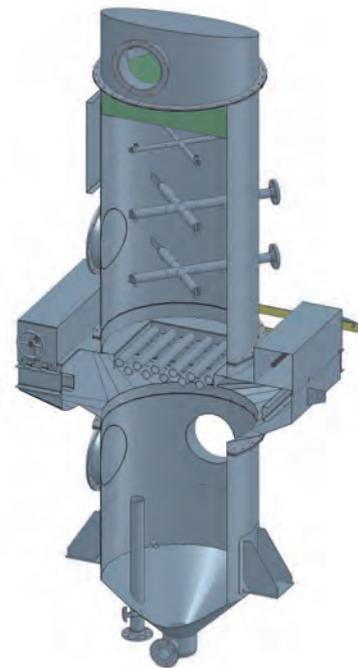
Hot Water Generation:

Mainly used for heating purposes such as offices, buildings and process water streams.

This solution is adequate for tobacco plants in colder areas in the world. During the summer a hybrid dry cooler (combination of air cooled dry cooler and closed circuit evaporative cooler) will eliminate the energy surplus.

Direct Steam Generation:

Mainly used to recover steam for direct reuse in the process it has been recovered from. In this case the inline-Venturi™ scrubber is cleaning the exhaust stream while operating above the boiling point of water (phase transition advantage). The applied Mechanical Vapor Compression (MVC) Heat Pump increases the pressure and temperature of the water vapor, exhausting from the inline-Venturi™.



The integrated tailor made design exists of a partial condenser and thermal siphon steam re-boiler (plate heat exchangers) that will generate fresh steam for the process in which the energy was recovered from. The theoretical energy recovery efficiency ranges from 70-85%.

PROJECT EXECUTION

JOA projects are executed applying the earlier described patents and proprietary GCM™ / V0crit™ modeling technology. An effective project execution method, based on 6Sigma, guarantees (1) An effective project definition phase. (2) Execution of a shop survey and measurement program provides important data to define the before (and after) situation. (3) & (4) Based upon this input a preliminary engineering design, including a GCM™ system model, will be provided. In close interaction with the customer's



engineering team, system requirements and budgets will be reviewed early on in the project (project feasibility). Important information enabling the customer to make the 'Go / No Go' decision is now well defined and documented. (5) Upon customer approval, JOA shall execute detailed engineering and (6) project realization, including real-time system performance monitoring and support, using our PMLA™.

Green field and optimization projects:

This 6Sigma based project approach is applied to both Green field and optimization projects. For Green field projects it is evident how the GCM™ plays an important role in guaranteeing a long-term Sustainable Solution.

For system retrofits, by history matching a GCM™ model of the existing situation, clear problem definition is achieved, from which many optimization projects will benefit.

The 'living GCM™-model' will serve tobacco plants from the pre-project decision making phase, through project execution, until operational (production) phase.



Measurements programs and shop surveys to collect key input for the design process.



JOA project teams executing turnkey projects.

TOBACCO PRODUCT GROUPS

PRIMARY SOLUTIONS

Odor and Vapor Extraction of:

- DCC's / DCCC's / Casing cylinders
- Rotary dryers / Flash dryers
- STEM / CRES Lines
- Belt transitions

JOA Tobacco solutions:

- Pre-separators / Heated false air units
- Inline-Venturi™ scrubbers / Odor scrubbers

Dust Extraction of:

- Cutters (incl. spark handling)
- Belt conveyers
- DIET / ET lines

JOA Tobacco solutions:

- High efficiency cyclones / deflector™ hood designs
- Dry dust filters

SECONDARY SOLUTIONS

Maker Feeding Systems:

- Optimized conveying velocity (VOcrit modeling)
- Minimized degradation piping design
- Force balanced feeding control

JOA Tobacco solutions:

- Aluminum piping system to minimize fiber degradation
- FBFC-Unit™ handling careful tobacco conveying

Maker Stability by Balanced:

- VE de-dusting / MAX de-dusting
- STEM / Charcoal / Menthol De-dusting
- Laser fume extraction

JOA Tobacco solutions:

- Carrousel™ technology
- Dry dust filters (ATEX) / High efficiency degritters
- Laser fume activated carbon units

ENERGY SOLUTIONS

Heat recovery for steam / Hot water generation from:

- Flash towers, CL dryers and ESS units

JOA Tobacco solutions:

- Integrated ERD™ scrubber skid
- MVC heat pump direct steam generation

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