

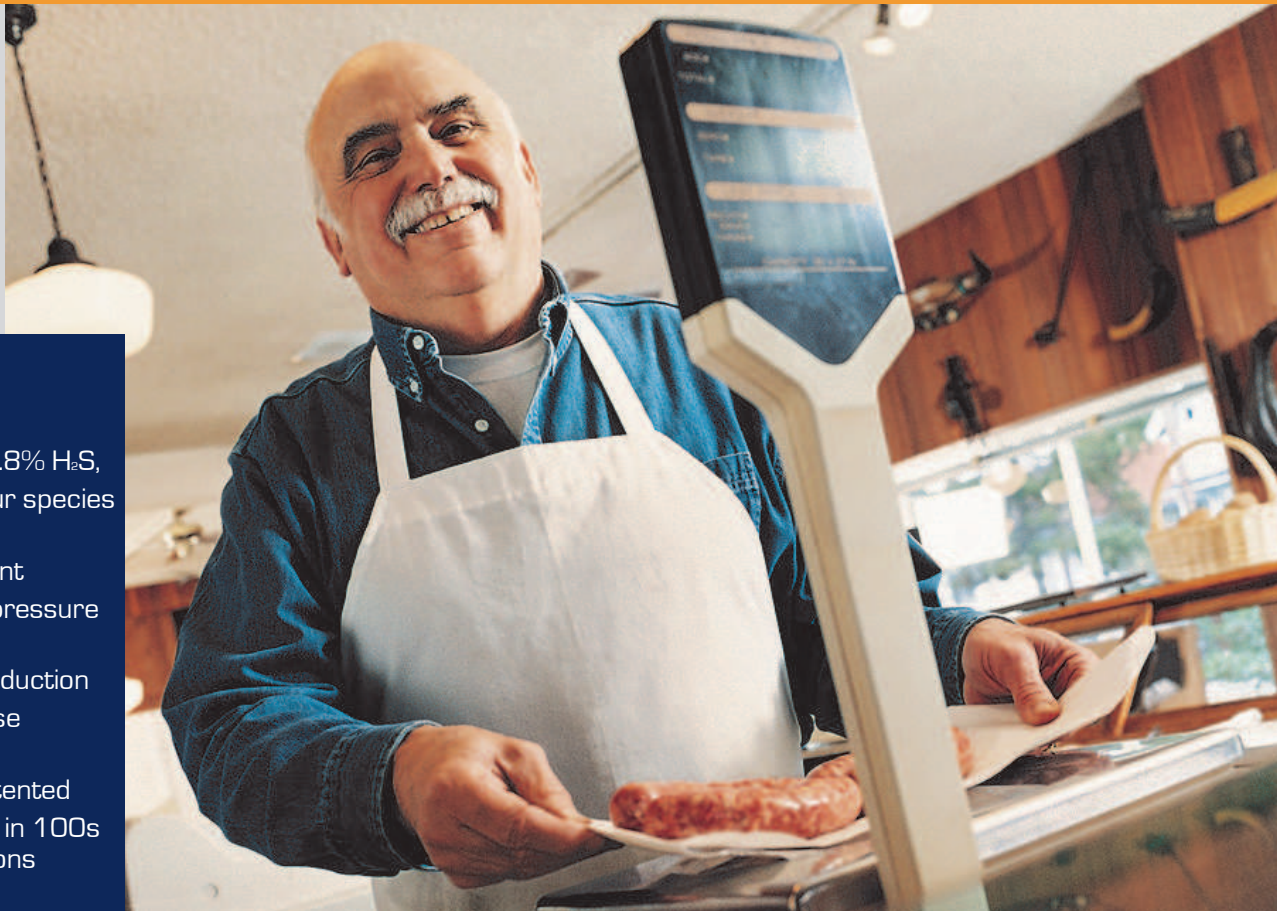
# AZZURO

## AZZURO, INC.

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## AT A GLANCE

- ✓ Removes up to 99.8% H<sub>2</sub>S, CS<sub>2</sub> and other sulfur species
- ✓ Operates at ambient temperature and pressure
- ✓ Provides a 95% reduction in operating expense
- ✓ Is a unique and patented technology proven in 100s of global installations



The **BEST** Solution for Reducing Sulfur Emissions in the Viscose Industry ...  
Provided by Azzuro, the leader in Biological & Economical Sulfur Treatment

## Industrial Challenges

Global environmental concerns continue to drive increasingly stringent government requirements for reducing harmful industrial effluents. Emissions of sulfur gases such as H<sub>2</sub>S, CS<sub>2</sub>, and COS are a source of constant regulatory scrutiny. These components are commonly present in the off-gases from a broad range of viscose industries and other chemical processes and therefore they face a constant challenge to comply with legislation and remain competitive.

The conventional way to reduce emissions in this industry is by installing thermal oxidizers, often in combination with chemical scrubbers, or by installing large carbon beds. Investment is high, as are the operating costs, caused by increasing energy costs, carbon replacement, demanding maintenance and by having to add chemicals. The corrosive reaction of sulfur has its own impressive impact on OPEX.

Taking into account the hazardous and explosive characteristics of CS<sub>2</sub> and knowing of the risks involved in operating these installations, many HE&S Managers and Plant Operators are looking for alternative, yet reliable, solutions. If you are too, and if cost savings are high on your agenda as well, you want to consider Azzuro's *BEST* Solution.

## Azzuro's *BEST* Solution

*BEST* is a natural biological process that takes place within a high performance bioreactor containing a very large and robust population of selected bacteria operating at ambient temperature and pressure. The bacteria are retained using a unique and patented immobilization technology to ensure the growth of a uniformly porous bacterial sponge through which a sulfur-rich gas stream flows with small amounts of water introduced in the process.

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Natural bacterial metabolism efficiently oxidizes sulfur, producing clean effluent air and sulfuric acid. The acid might be re-used for various purposes in the manufacturing process or, alternatively, can be neutralized using inexpensive industrial lime, and then discharged.

Minimal requirements for this natural biological process include only airflow, moisture, and small amounts of added nutrients, all of which are reliably maintained by the bioreactor's control system.

The bacterial sponge is contained in a fiberglass reinforced polyester tower along with all other non-corroding components of construction. This is a standardized modular design that can be easily installed with parallel units handling higher sulfur removal requirements.

The bioreactor includes one or more disc-shaped microbial beds stacked in a cylindrical tower. Sprinklers distribute water over the surface of each bed and air flows through the beds. Within each bed, bacterial activity oxidizes sulfur to sulfuric acid. Clean air then exits at the top of the tower and the acid is collected at the bottom.



## Partial Track Record Highlights

### Project: DOW Chemicals, France

Type of application	: Pesticide manufacturing
Air flow	: 9.000 m <sup>3</sup> /h
Contaminants	: 300 ppm H <sub>2</sub> S (avg.) (2.800 ppm peak) 300 ppm CS <sub>2</sub> (avg.) (1.800 ppm peak)
System configuration	: 4 x HPB Torrenta
Removal efficiency	: < 90% of H <sub>2</sub> S and 80% of CS <sub>2</sub>
Date installed	: 1998

### Project: 3M, Ohio, USA

Type of application	: Sponge manufacturing
Air flow	: 92.000 m <sup>3</sup> /h
Contaminants	: avg. of 400 ppm H <sub>2</sub> S and 300 ppm CS <sub>2</sub>
System configuration	: 6 x HPB Torrenta -1999 and expanded with another 3 x HPB Torrenta in 2003
Removal efficiency	: < 99% of H <sub>2</sub> S and 80% of CS <sub>2</sub>
Maximum emission	: < 10 ppm CS <sub>2</sub> /m <sup>3</sup>

### Project: Arvesta, Ohio, USA

Type of application	: Fungicide production
Air flow	: 8.500 m <sup>3</sup> /h
Contaminants	: 300 ppm CS <sub>2</sub> (average)
System configuration	: 2 x HPB Torrenta
Req. removal efficiency	: 97% of CS <sub>2</sub>
Maximum emission	: < 10 ppm CS <sub>2</sub> /m <sup>3</sup>
Date installed	: 2002

### Project: ViskoTeepak, Finland

Type of application	: Cellulose casing production
Air flow	: 65.000 m <sup>3</sup> /h
Contaminants	: 1.200 mg/m <sup>3</sup> CS <sub>2</sub> and COS and 350 mg/m <sup>3</sup> H <sub>2</sub> S
System configuration	: 6 x HPB Torrenta
Req. removal efficiency	: < 80% of CS <sub>2</sub> and 90% of H <sub>2</sub> S
Date installed	: 2006

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*Project: Viskase, Arkansas & Tennessee, USA*

Type of application	: Cellulose casing production
Air flow	: <i>confidential</i>
Contaminants	: CS <sub>2</sub> , COS and H <sub>2</sub> S
System configuration	: HPB Torrenta
Req. removal efficiency	: < 90% of CS <sub>2</sub> and 99% of H <sub>2</sub> S
Maximum emission	: <i>confidential</i>
Date installed	: 2005, expanded in 2011 and 2012

## Value Delivered to You

### Improved Performance

- Capacity for removal of up to 99,8% of off-gas concentrations up to 2.500 ppm greatly exceeds the capabilities of other abatement approaches.
- Other emissions such as HCN, NH<sub>3</sub>, and VOCs are also treated.
- Efficiency is maintained over a wide and varying range of inlet sulfur concentrations and ambient temperatures.

### Reduced Cost

- In contrast to expensive thermal oxidation chemical scrubbing and carbon beds, the *BEST* solution consumes very little energy while eliminating the cost of chemical consumption, handling, and storage.
- All internal components are corrosion free and require no maintenance.
- Operating expenses related to conventional treatment of the off-gas can be reduced by over 95%.
- CAPEX is typically recovered in less than 24 months.

### High Reliability

- Performance is based on experience in 300 global installations over 15 years.
- Start-up, commissioning, and routine operation (if requested) monitored on-site or remotely by Azzuro's field service engineers located in Scottsdale, Arizona, USA.

### About us ...

We have been the global leader in designing, engineering, and maintaining high efficiency biological reactors for over 15 years.

Our designs have evolved based on experience with over 300 installations, both industrial and municipal, for controlling emissions from a wide range of processes including wastewater treatment, agri-business, food and beverage, biogas, plastics, and others.

The superior efficiency, reliability, and economy of our products is a direct result of this experience along with our dedication to continually improve a technology that is endorsed by some of the world's largest engineering and consulting firms.

*Going Green is good for the environment.  
Going Green with Azzuro is also good for business.*