NEW TECHNOLOGY FOR THE TREATMENT OF SMOKE IMPACTED WINES

Smoke impact can devastate vineyard and winery revenue

Wildfires cost the United States wine industry US$3.7 billion* in 2020, in lost revenue, wine inventory, grapes and property.

Yet despite the increasing size of the problem, **current treatments for smoke impacted wine are less than optimal.** While they reduce smoke aroma and flavor, they might also **change texture,** making it **difficult to recover the full potential of the wine.**

New molecular filtration technology significantly improves sensory outcomes

Developed especially for the treatment of smoke impacted wines, **amaea VPx** uses molecularly imprinted polymers (MIPs) to capture volatile phenols. This selective targeting **removes the smoke aroma and flavor,** while **preserving the varietal character and body** of the wine**.**

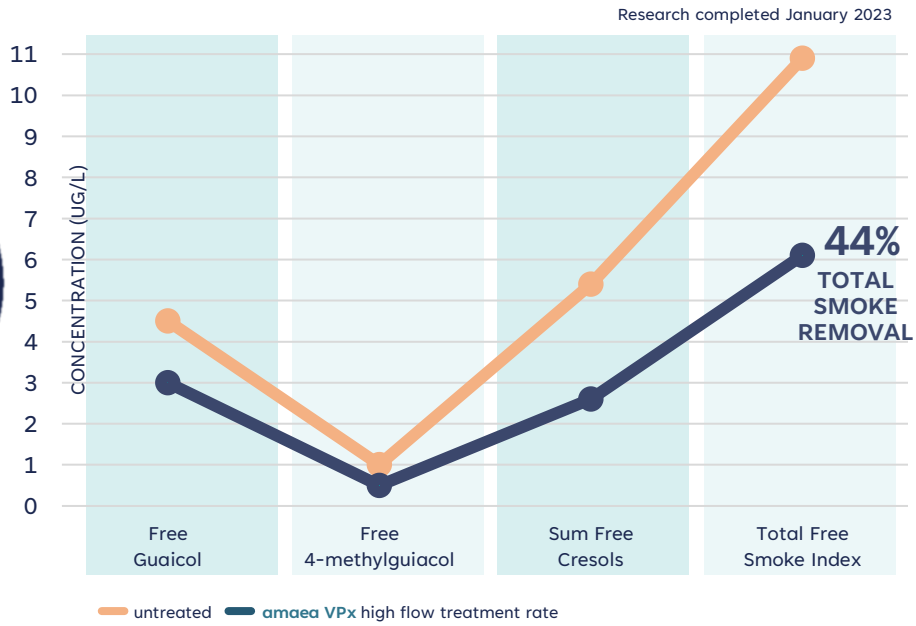
amaea VPx treatment rates can be tailored to specific wine types and smoke severity levels. Treatment can reduce volatile phenol concentration by 15-80% depending on the level of remediation you choose. Most common treatment rates typically result in a 40-50% reduction in volatile phenols.

Key data: volatile phenols

The following results are from the treatment of a smoke impacted Cabernet Sauvignon.

44%
REDUCTION
of free smoke marker compounds after amaea VPx

Research completed January 2023

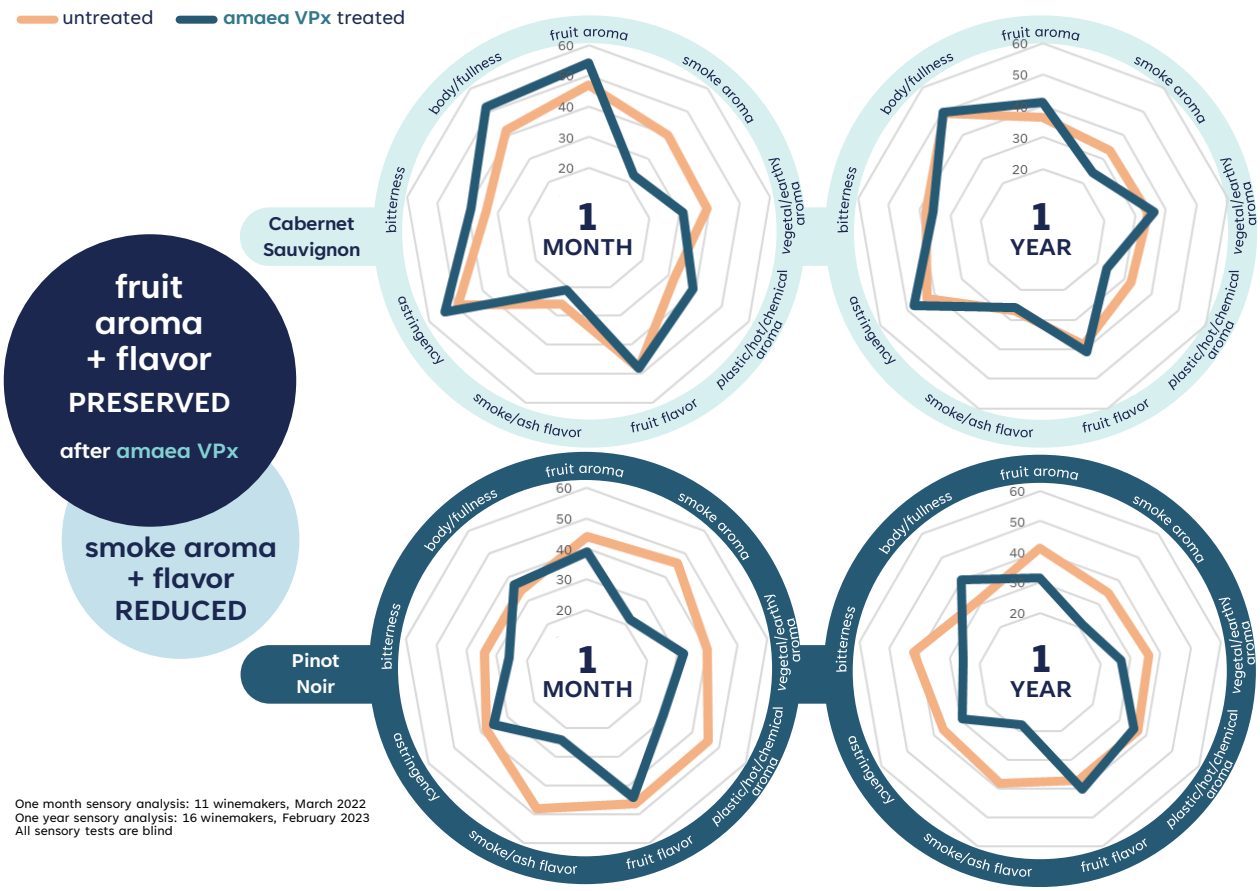


* Estimate provided by The California Wine Institute and BW166 study calculating the cost of the 2020 wildfires to wineries.

2023APRUSMUE

NEW TECHNOLOGY THAT IS FOCUSED ON SENSORY IMPROVEMENT

Key data: sensory after treatment



fruit aroma + flavor PRESERVED after amaea VPx

smoke aroma + flavor REDUCED

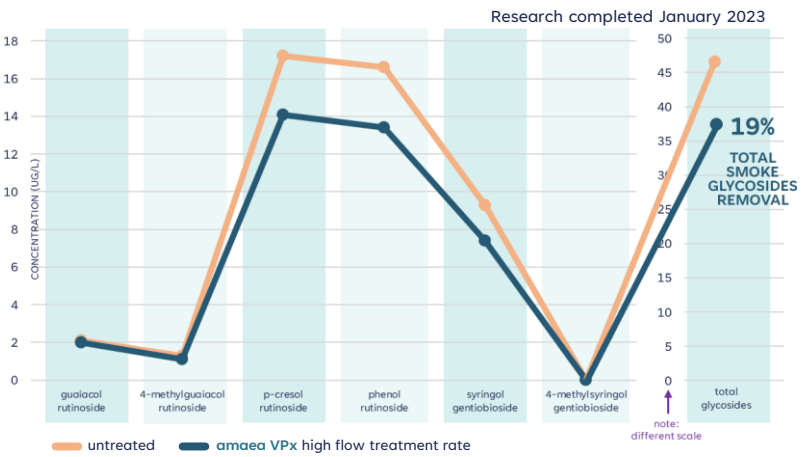
One month sensory analysis: 11 winemakers, March 2022
One year sensory analysis: 16 winemakers, February 2023
All sensory tests are blind

Key data: smoke glycosides

The following results are from the treatment of a smoke impacted Cabernet Sauvignon

19% REDUCTION of smoke glycosides after amaea VPx

Research completed January 2023

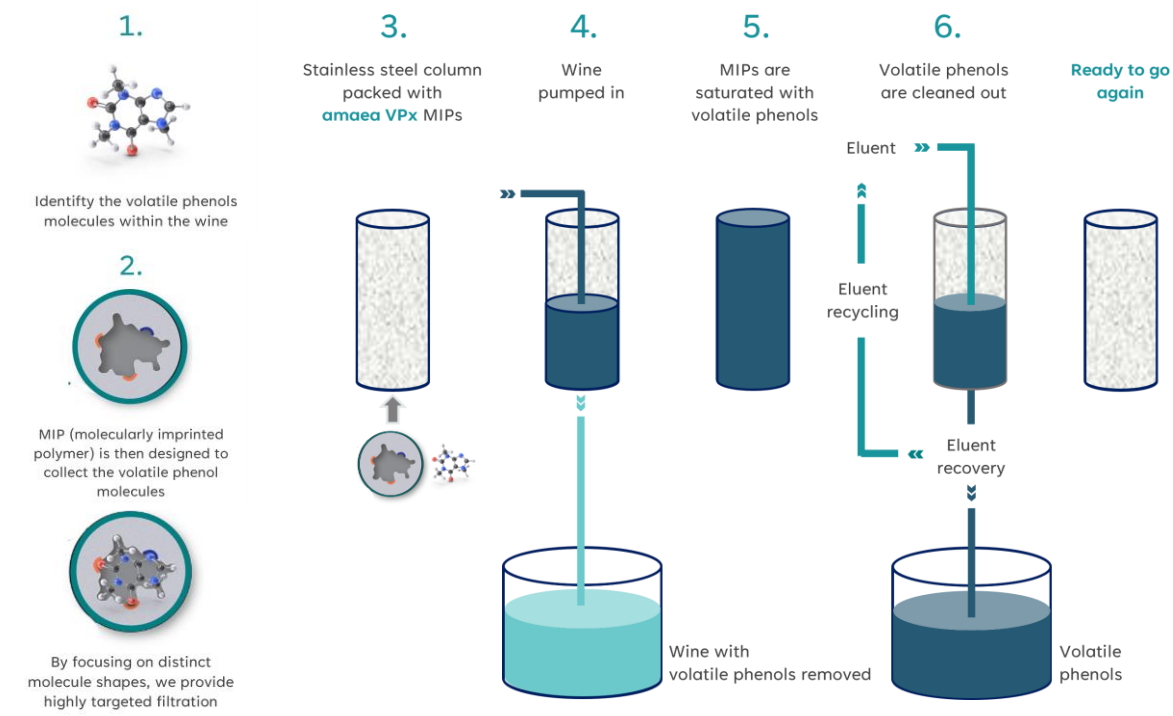


AMAEA VPx REMEDIATES SMOKE BASED ON WINEMAKER'S PREFERENCE

amaea VPx

- ✓ **retains key sensory qualities of the wine**
- ✓ **ability to choose treatment rates to retain varietal character and body**
- ✓ **enables recovery of value from smoke impacted wine**
- ✓ provides selective removal of volatile phenols at scale and pace
- ✓ easily integrated into your existing production process at your location
- ✓ tailored treatment plan by wine type and smoke impact severity

Simplified view of our molecular filtration process



Who is amaea?

We are a New Zealand company providing molecular filtration solutions to companies in the food, beverage, health, therapeutics, flavor and aroma industries across the globe.

Working with the wine industry, we have pioneered **amaea VPx** filtration technology to minimize the smoke impacts in wine.

Ready to take the next step?
Contact Jonathan Engle

jonathan.engle@amaea.com
+64 21 615 334

2023APRUSMJE

FREQUENTLY ASKED QUESTIONS

What is amaea VPx?
It is a molecular filtration solution developed especially for the treatment of smoke impacted wines. It utilizes specifically designed molecularly imprinted polymers (MIPs) to capture volatile phenols.

What are MIPs?
Molecularly imprinted polymers (MIPs) are smart materials that can selectively capture and remove specific molecules or groups of molecules. Each MIP type has been designed to capture a specific molecular target from within a liquid. MIPs are 0.5-3mm beads containing billions of specific molecular capture sites.

When the target molecules (eg. volatile phenols) are brought into contact with the MIP, they fit perfectly in the capture cavity. A wash process is then used to release the target molecule from the MIP cavity, so the MIPs can be reused.

Does it work?
Yes. Smoke removal has been demonstrated through extensive trials, first on the bench and then in the winery. The large amount of data collected shows a significant reduction in smoke markers (analytically) and a clear improvement in sensory profiles, after treatment with **amaea VPx**.

Since every wine and smoke event is different, the winery can tailor the treatment to suit their style.

Is it TTB* approved for continuous use?
As of March 2023, TTB approval is pending. **amaea VPx** is compliant with the FDA (Food & Drug Administration) regulations in the US and food contact regulations in Canada and New Zealand.

*US Alcohol & Tobacco Tax & Trade Bureau

What level of volatile phenol removal is possible?
Laboratory and winery trials demonstrated roughly 15-80% removal of volatile phenols across multiple treatment dose and flow rates. Reduction of color and body can occur at higher treatment rates, so we recommend using the **amaea VPx Tuner** to determine the optimal treatment rates for your wine.

sales@amaea.com

FREQUENTLY ASKED QUESTIONS

When using amaea VPx, can you tailor the level of treatment?
Yes. Unlike many existing smoke treatments, **amaea VPx** allows winemakers to control the level of treatment to best suit the specific characteristics of their wine, ie. varietal, complexity, degree of smoke impact.

Selection of a desired treatment level can be achieved by modifying dose rate (a measure of the available capture sites) and flow rate (a measure of the contact time of the wine with the MIPs) to deliver anywhere between 15-80% reduction of volatile phenols in a single treatment cycle.

Does it remove the smoke glycosides?
In certain wines, smoke glycoside removal has been observed after **amaea VPx** treatment. Refer to page 2, where testing showed 19% reduction of smoke glycosides in one wine after **amaea VPx** treatment. We are working on specific MIP applications for the relevant smoke compounds, including glycosides and thiols.

Does amaea VPx treatment strip other aromas or affect mouthfeel?
The targeted nature of **amaea VPx** means that it has high affinity to the volatile phenols whilst leaving the other desirable compounds in place.

We recommend that you use the **amaea VPx Tuner** to fully understand how the treatment impacts your specific wine.

How does a winemaker know how much to treat, at what rate?
Prior to treatment of the full volume, we would advise utilizing the **amaea VPx Tuner** to identify the optimal treatment rate. This will then give the winemaker the ability to choose the treatment level appropriate for the specific wine.

Can the cellar team do the work or does an outside company need to come onsite?
This would depend on the volume of wine to be treated, as well as the resource availability onsite. Our team can answer this for you once they have more details about your treatment requirements.

How many gallons can a system treat?
Dependent on the size of the available system(s) up to 40,000 gallons per day can be treated. Systems can be scaled to achieve multiple treatment volumes.

sales@amaea.com

FREQUENTLY ASKED QUESTIONS

How long does a treatment take?
This is dependent on system size, however, typically around 750-6,000 gallons per hour.

How much does treatment cost and how do you set price?
The pricing is dependent on several factors including throughput, how impacted the wine is and whether the treatment is being delivered via a service provider or directly. Our team can answer this for you once they have more details about your treatment requirements.

How do you regenerate the MIP?
After a specified throughput, we regenerate the MIPs by washing them with ethanol. This releases the captured molecules and prepares the MIPs for the next treatment cycle.

Are there special cleaning chemicals needed or could we use what we already have?
Ethanol is the most effective and preferred eluent to clean the MIPs. We are currently working on alternative options to ethanol, these options are likely to be sourced from chemicals already available within the winery process.

How much ethanol is required?
The volume of ethanol required is dependent on the system size, volume of wine treated and treatment conditions such as dose rate. The ethanol can later be regenerated and reused in subsequent treatments.

Are there special personal protective equipment (PPE) requirements to undertake the regeneration?
No, standard site PPE can be used. Additional PPE maybe required for higher volume ethanol handling.

Are there any special permits needed to use amaea VPx MIPs?
No special permits are required.

When can we do a trial on our own wines?
As soon as you are ready. Contact Jonathan Engle at amaea about organising a trial. Email Jonathan at jonathan.engle@amaea.com or phone +64 21 615 334.

Ready to take the next step?
Contact Jonathan Engle

jonathan.engle@amaea.com
+64 21 615 334

2023APRUSMJE