Bulk oil flotation

Early flotation processes relied on oil flotation rather than bubbles. These techniques produced inconsistent results and few of the original processes are still in use. One of the early developments was the centrifugal flotation process, which is still being used today, often to clarify white juice after cold settling. Oil flotation also relies on oil for the mechanical separation of the particles being clarified. The oil floats on the clarified water, allowing the solids to sink to the bottom of the tank.

Vacuum flotation

The Elmore vacuum technique relied on both oil and bubbles generated by the vacuum for separation of minerals. The Australian Wine Research Institute, PO Box 197, Glen Osmond (Adelaide) SA 5064, Australia

Dissolved air flotation for paper wastewater

Dissolved air flotation was first used for water clarification in the Scandinavian paper industry in the 1920s. Air was dissolved under high pressure, and released to generate the bubbles. The original Sveen-Pedersen process, Pedersen had designed the equipment, but it was only successful with gluex additives that enhanced flocculation of the particles and bubbles. Rectangular cells are convenient because they often fit in limited spaces.

Potter-Delprat flotation

This process relied on the inclusion of carbonates in the ore body that generated air bubbles when treated with acid. This process was developed in Australia, which played a key role in the development of minerals flotation techniques in the early 20th century.

Chemicals

Flotation plays a critical role in allowing the efficient separation of different minerals by flotation, even in ore bodies that are classified as refractory. They are categorized as frothers, collectors, activators, depressants, modifiers and flocculants.

Mechanically agitated flotation cells

Mechanically agitated cells rely on agitation to entrain air into the pulp mixture. A multistage system is shown, with the discharge from each stage feeding the subsequent stage.

High capacity rectangular systems

Even higher capacity parallel rectangular systems use plate packs and are sometimes containerised for easy installation.

Recirculating on a tank

This reduced investment even more by using much cheaper sub-aerated agitated flotation cells (but with bubbles are still likely bigger than those in other systems. They are described as frothers, collectors, activators, depressants, modifiers and flocculants.

Non-animal, non-allergenic fining agents

Plant- and potato proteins, fungal chitosan, and bacterioferritin are often now being used instead of gelatin to address consumer requirements for vegan and non-allergic wines and to keep labels clean. Some of these agents and combinations work better than others.

Acknowledgements: Winery staff and suppliers that provided information and the AWRI library.

References: This poster is a summary only - a more detailed article may be written in the future. The inclusion of any product does not indicate an endorsement by AWRI.

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Wineries using different juice clarification techniques in Australia in 2016

Wineries using different juice clarification techniques in Australia in 2016 (www.awri.com.au/survey)

The Australian Wine Research Institute, PO Box 197, Glen Osmond (Adelaide) SA 5064, Australia

The AWRI is a member of the Wine Innovation Cluster.

Jameson Cell

Developed in Australia in the late 1960s, the Jameson cell creates bubbles for flotation in theuscum. The cell is jettisoned, entering air and agitating the ore. The technology has been very successful in the mining industry, since it produces a cleaner tailings. The Jameson Cell sub-aerated mechanically agitated flotation cells. (This cell is still being used in the water and wine industries.)

Mechanically agitated flotation cell with sub-eration

Air is injected and then dispersed by the agitator reducing the need for extreme agitation for air entrainment. Modern optimised cells based on this general principle are very common in the minerals industry today.

Partial recycle stream

In addition to clarifying white juice, flotation is quite commonly used overseas to clarify red juice from heated/flash détente-treated grapes. The Jameson Cell, developed in Australia in the 1960s, is still being used today.

High capacity shallow circular systems

Feed enters the separation tank via the arm in the opposite direction to its rotation such that the particle-bubble floccs are not disturbed. Floats are then removed by a scoop on the same rotating arm. This process was introduced in the 1970s - other lower capacity circular systems had been used prior.

Other continuous arrangements

Rectangular systems have also been used at times in wine production, but these systems have now been discontinued in favour of circular systems. Circular systems with rotating arms or rings that push floats over a weir are now most common.

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