

MASTER BREWERS ASSOCIATION OF THE AMERICAS

Which Filter?

Diatomaceous Earth vs. Crossflow: What's Best for Beer?

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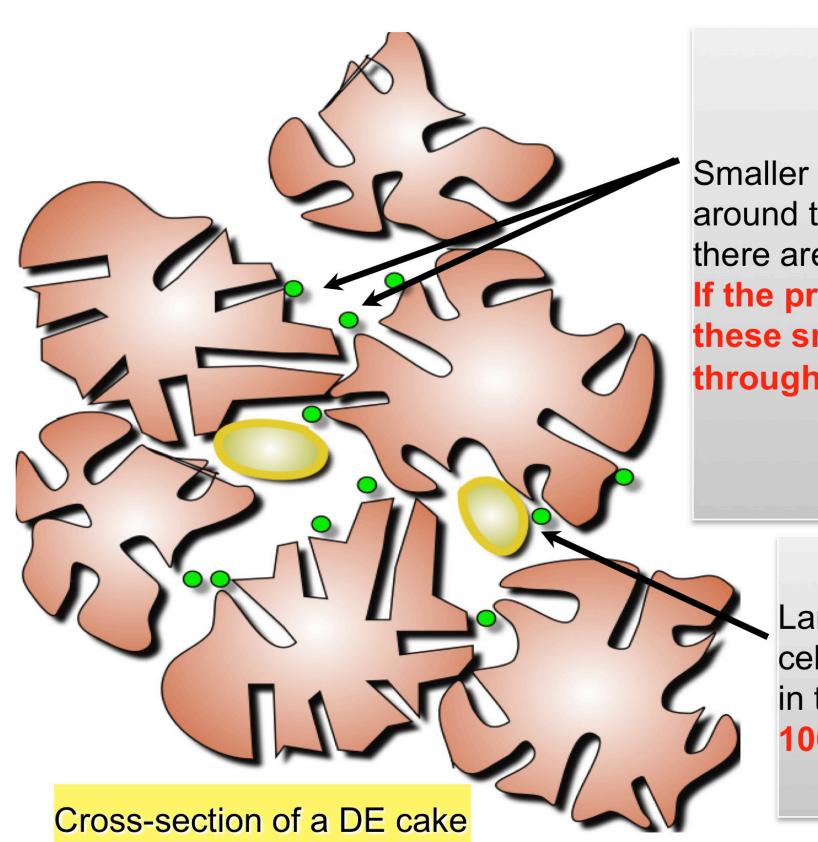
Why Filter?

- Pre-20th century, the masses were drinking beer out of pewter tankards or
- Drinking out of glasses was the reserve of the rich
- Drinking from clear glasses, good lighting, and extended shelf-life expectations all drove attention to filtration clarity
- Only recently has there been a return to an acceptance of less-than-bright beers, as evidenced by the growth in popularity of unfiltered local craft and wheat beers



How DE Works

Filtration with DE is flexible, not mechanical



DE vs. Crossflow: Total Cost of Ownership

-Product

-Manpower

Parameters measured:

Installation/investment

-Waste water Water -Carbon dioxide Air quality Cooling -Steam Electricity -Cleaners Beer loss -Spare parts Membranes

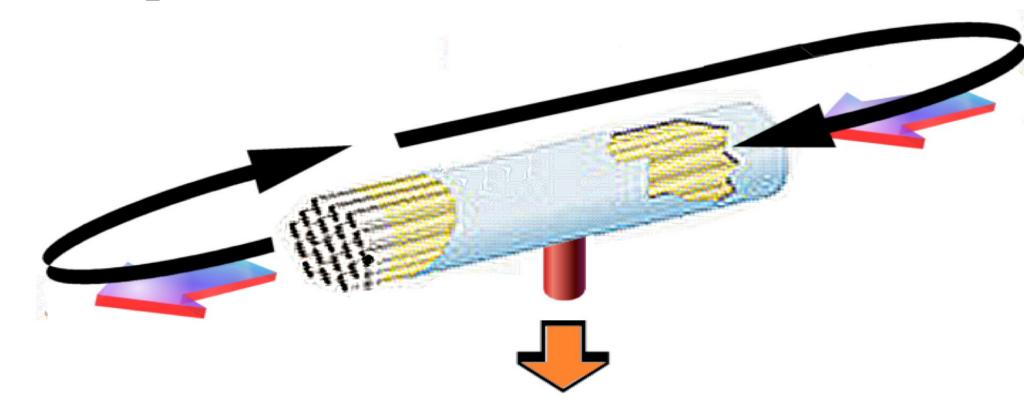
Findings: Crossflow costs 30% more over a 5 year TCO vs. DE ("Kieselguhr vs. Crossflow Filtration: Economical & Ecological Aspects", VLB Berlin Intl. Brewing Conference, Bangkok, June 2011)

Filtration Techniques

- 200 years ago it was possible to produce a crystal-clear beer, but it wouldn't stay that way for long
- The original process relied on sedimentation & decantation. Finings were used and are still excellent at clearing beers. Centrifugal separators can also be used to take out the yeast
- To remove micron/submicron hazes without finings, you have to resort to filtration. Surface filtration with cartridges, sheets or bag filters works fine for low solids loadings, but will not work for beer as the filter life would be too short
- Filter-aid filtration, usually with DE, is the most costeffective and all natural way of clarifying beer

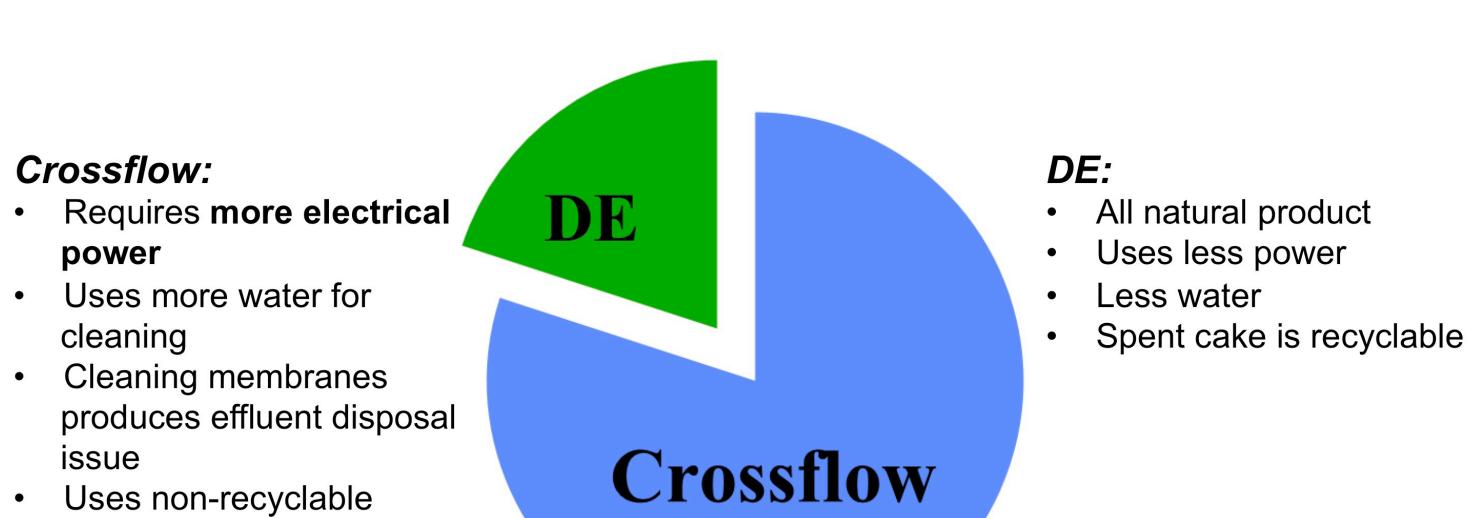
How Crossflow Microfiltration Works

- Crossflow microfiltration provides surface filtration but instead of running the beer towards the surface of the filter, it is kept moving tangentially in a recycle loop
- The flow across the surface keeps the membrane clean & permeable while the solids concentration builds up in the recycle
- Technology is used in other industries such as apple juice clarification. Membrane life can be unpredictable and there are cleaning issues



DE vs. CrossFlow: Resource Usage Comparison

Water, Energy and Greenhouse Gas Emissions



The History of Filter Aid

have been used throughout history: Crushed beach shells Crushed carapaces of shrimp,

There have been plenty of filter aids that

cockroaches, locusts & beetles Coconut fibres Peanut shells

Husks from rice

However, DE remains the dominant filtration technique for beer for larger scale brewers: It's all natural

 Readily available Efficient

Let's compare the two primary polish filtration techniques

Crossflow Filtration

- Aggressively marketed and under investigation by brewers for the past 25 years
- 2-3 new installations per year
- 5% of global beer production is filtered with crossflow

DE Filtration

- 95% of global beer production is filtered with DE The dominant means to clarify beer for over 50 years
- Over 30 new installations annually

Images: Davagi-Mendels and The Institute of Brewing & Distilling

DE vs. Crossflow: Sustainability

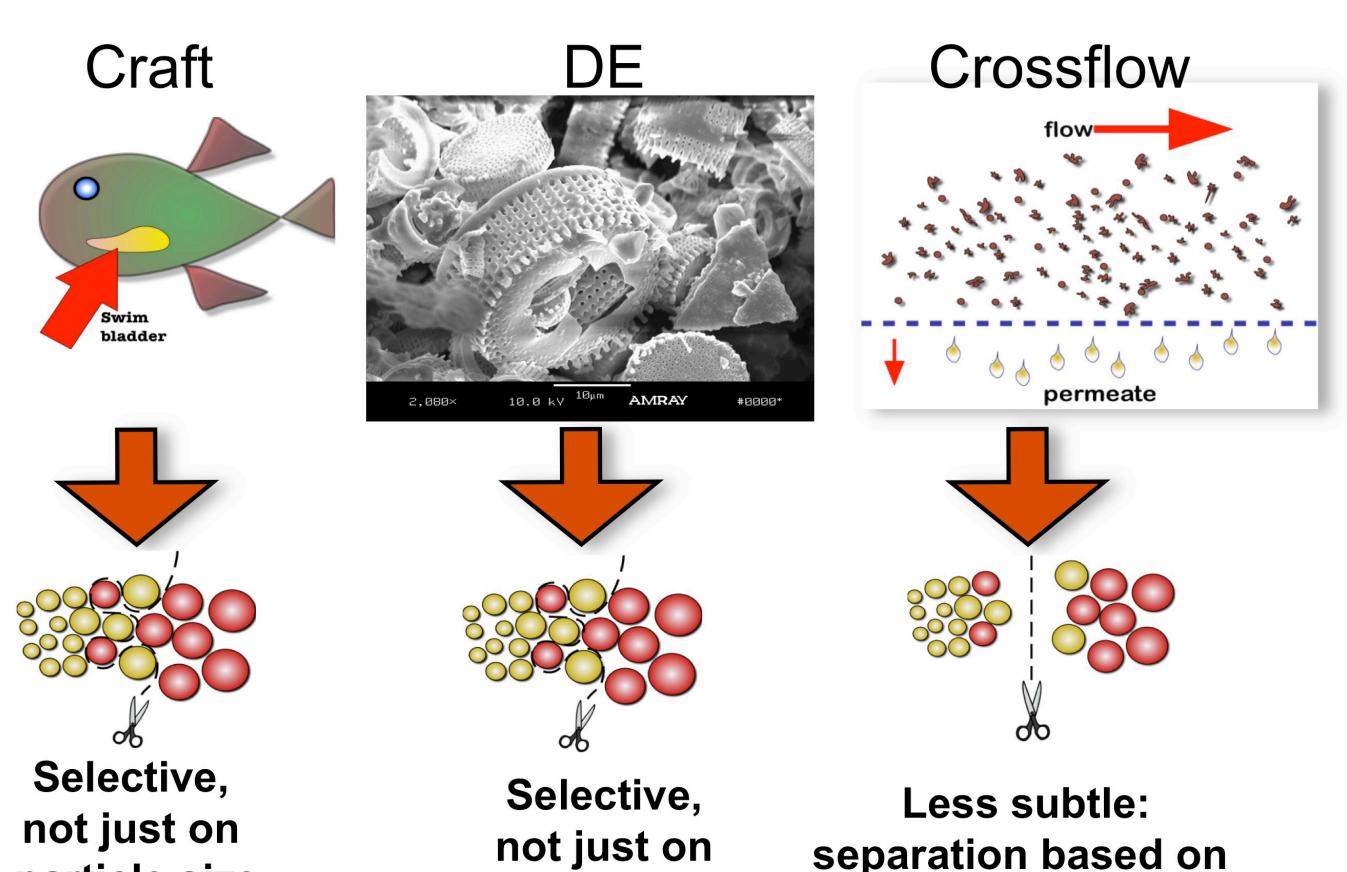
DE

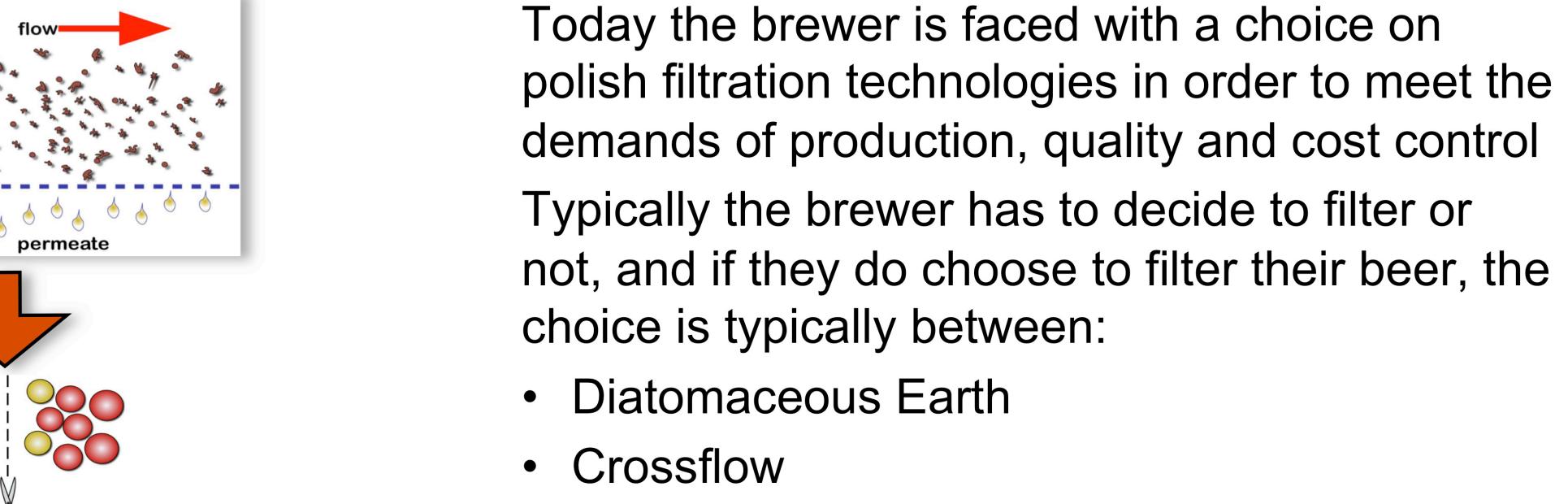
- DE spent cake is successfully being recycled into fertilizer, compost, biogas, cement and bricks today
- Many farmers and ranchers collect it from breweries for animal feed or composting

Crossflow

- Worldwide disposable filter cartridge sales are now at \$15 billion per annum
- This creates over 1 million tons of spent cartridges, most of that is unrecyclable polypropylene or similar plastic
- Crossflow has no true ecological advantage

Predominant Polish Filtration Methods





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The Brewer's Dilemma

DE vs. Crossflow: The Pros

DE: A Renewable Source

Myth: DE will ultimately run out. There is no

DE can be made from fresh diatomite

Plenty of quality reserves available.

deposits. High-purity diatom sediment

No shortage expected within the next 400

Quality filter-aid DE is not going to run out!

evidence whatsoever to suggest that this is

continues to accumulate in lakes to this day

particle size

- Lowest dollar cost per BBL filtered
- Highest filtration efficiency Easily handles beer's varying

DE

particle size

filterability issues

the case

years.

Predictable and repeatable cycle

Seamless transition to different beer

- Filtration media is interchangeable,
- regardless of equipment supplier Low water and energy consumption
- Readily available; multiple suppliers of high quality filter media

- No material handling, storage and dust control issues
- No DE spent cake disposal issues
- Higher level of automation

Crossflow

- Disposal of spent cake However, spent cake is being successfully recycled today
- Respirable dust issue
 - Can be eliminated by wearing simple face masks and using automatic systems. Bag slitting machine and silo plants avoid exposure to DE powder

DE vs. Crossflow: The Cons

- Crossflow Higher energy & water
- Unpredictable & inconsistent flux

consumption for processing and

- Frequent failures
- Short service life of membranes: 1-2 years
- Expensive membrane
- Expensive cleaning agents
- Disposal issue with non biodegradable solid waste (plastic)

Conclusion: Diatomaceous Earth is Still the Best Choice for Beer Filtration

- All Natural
- Recyclable
- Low cost
- Flexible & adaptable to bring out the true "personality" of your beer
- Allows you to pursue the "art" of brewing
- Readily available
- High efficiency, high throughput