Developments in Diatomite Filtration Over the Past 25 Years

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Beer sold to a discriminating American market today makes exacting demands on the filtration industry. In a highly competitive market beer is sold on the qualities of taste and appearance. Processing, including filtration, is critical. Consciousness of the importance of filtration has automatically resulted in some interesting developments in the field of filtration engineering over the past 25 years.

The word *filter* derives from *felt* and *fiber*. Many in the chemical processing industry have tenaciously stuck with a filtration system that continues to rely on fiber in one form or another. Notable exceptions were Berkefeld ceramic candle, sand, and gravel water filters. However, for the brewer the only practical filtration systems were based on cotton fiber or pulp.

When systems based on diatomaceous earth were introduced during the second and third decades, while the chemical industry became an early adopter, prohibition sidelined the brewing industry. Revived in 1933, the industry re-implemented a familiar but outdated filtration technology.

The Demand for Brilliance

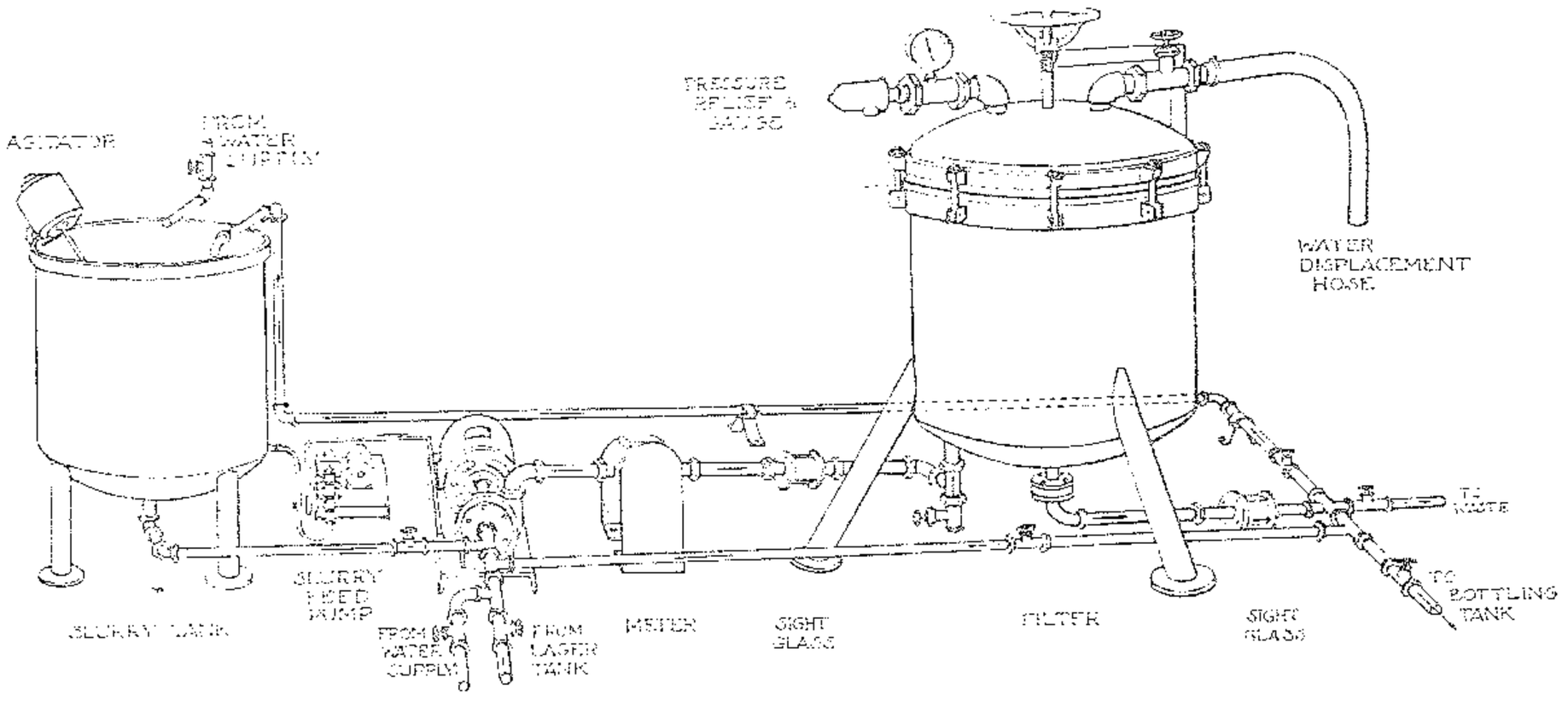
In no part of processing was there a greater demand for filtration than polishing. This was due to the unique American habit of "drinking with the eyes." Nowhere else in the world does the consumer demand brilliance, sparkle and stability. But achieving this visual standard on a reliable basis strained the capability of traditional technology. A new process had to be found that guaranteed removal of all suspended matter *and nothing else*.

In addition, high flow-rates for extended periods of time became essential. The filter media, as such, had to be free from any impurities that might transfer off-flavors to the final product. In addition, any new equipment had to offer laboratory grade sanitation, and optimally economical operation.

Even as other industries embraced diatomite filtration, brew masters, remembering experience with *Kieselguhr* resisted following suit. This stuff contained impurities that readily dissolved in beer, giving it a noxious taste and odor. It contained colloidal clay that adsorbed and removed valuable, favorable characteristics from beer, and contained a high level of fines that clogged the filter.

Acceptance of Diatomite Filtration

Even with the success of diatomaceous earth (DE} filtering in so many other processing industries it took many years of arduous work and experimentation to convince the brewer that introducing "powder" into his precious brew resulted in a process that was much faster, simpler, and more economical than the traditional pulp filter, and it would not alter the unique taste or character of his brew. After two decades (1953) diatomaceous earth filtering has become generally accepted practice for the preliminary, "rough," filtration of beer.



Schematic of modern diatomite beer filter station

Equipment Development

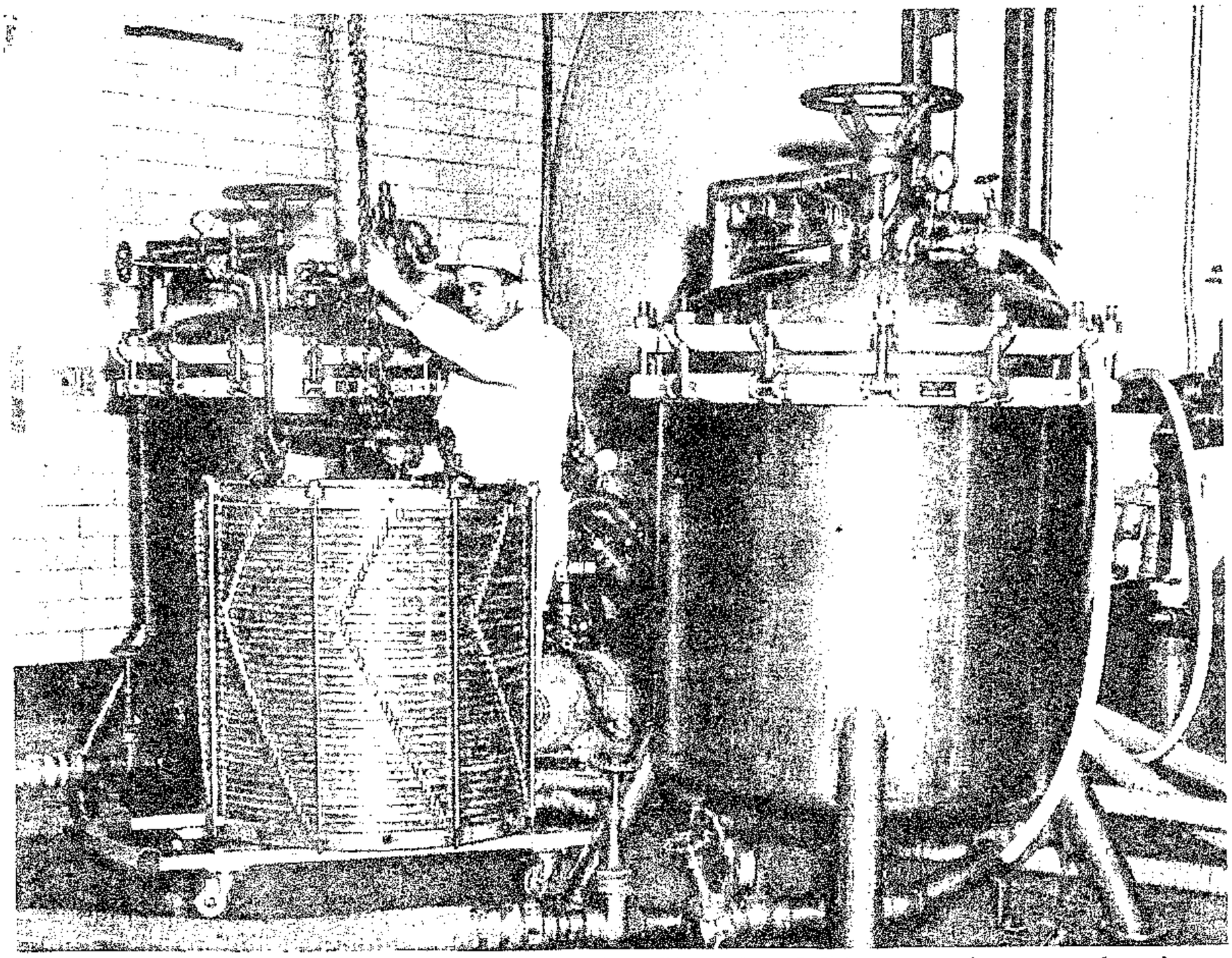
Two fundamental structural innovations enabled effective use of DE for the filtration of beer. First, was the shift from the vertical leafs of the filter press to the horizontal plates of the of the pressure vessel. It was found also that placing the filter septum, or filter bed, in a horizontal position made a more uniform deposit of filter aid or diatomite in the precoating phase of the operation. This horizontal design also virtually eliminated cracking, sagging, or breaking up of the cake, should the flow-rate change or become subject to an unanticipated complete shutdown.

In addition, paper supported by perforated screens proved more efficient and cheaper than the cloth required by the vertical leaf press. For less expensive than cloth, paper may be disposed as often as necessary to perverse required clarity. With it went any trapped impurities. However thoroughly hosed down or backwashed, cloth often retained trapped impurities.

Second, securing the entire filtration element within a pressure vessel secured from contamination by airborne bacteria. In contrast, such bacteria often found the moist cloth media that necessary extended outside the pressed leaves an hospitable environment. Nothing prevented from penetrating to the interior of the filter and contaminating subsequent batches of beer. In addition, placing the septa within a pressure vessel enabled much higher throughput than is possible with a filter press.

The total batch throughput of a pulp filter for "rough" filtration was around 300 to 500 barrels. In contrast, the total batch throughput for a single diatomite vertical screen filter was up to 3000 and 4000 barrels. For breweries designed for 500,000 barrels or more a year the appeal of the latter system became irresistible.

For pulp filtration polishing the cost, including labor, water, floor space, runs between 3 (24, 2009) and 6 (48) cents per barrel. With the horizontal plate diatomite filtration, costs approximate ½ (4) to 1 (8) per barrel. In truth, in today's competitive marketplace, cost is secondary to quality. It is well established that today's American beer is the ultimate of the brewer's art. The development of filtration by our American filtration engineers has played no small part in this achievement.



View of an installation of two beer polishing filters in a Midwestern brewery showing cartridge assembly.