



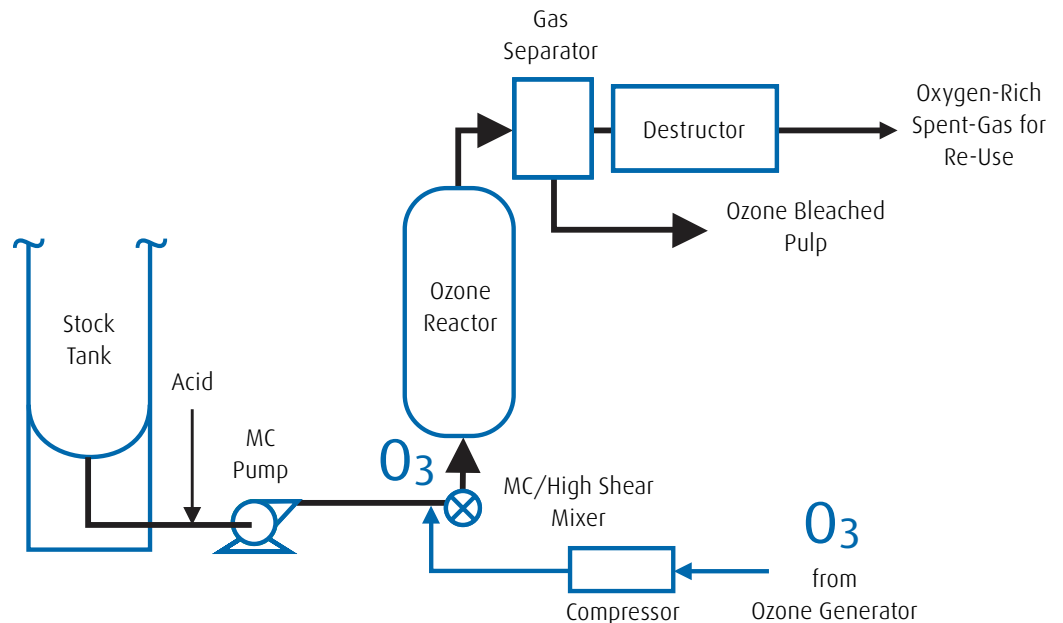
Pulp Bleaching with Ozone

Ozone (O_3) bleaching is a commercialized process in pulp bleaching technology. It is one of the key technologies to consider for total chlorine free (TCF) or elemental chlorine free (ECF) pulp production.

The need to further reduce or eliminate adsorbable organic halides (AOX), such as dioxins and furans, has forced the pulp & paper industry worldwide to examine or implement alternative bleaching technologies for ECF/TCF pulp production. Ozone bleaching, combined with oxygen delignification and other non-chlorine bleaching technologies, will enable mills to meet AOX emission standards. The process will result in a higher percentage of process water recycling, lower biochemical/chemical oxygen demand (BOD/COD) discharges, and reduced color in mill effluent.

There are approximately 20 ozone bleaching installations around the world. The majority of these installations are operated in conjunction with oxygen delignification, which precedes the ozone bleaching stage.

Typical Medium Consistency Ozone Bleaching System



A crucial factor in the implementation of the ozone bleaching process is a reliable, on-site source of high-quality ozone. Linde is one of the world's largest industrial gas companies and a major supplier of oxygen throughout the United States. Coupled with ozone generators sourced separately from one of the top original equipment manufacturers, Linde has the resources necessary to provide customers with ozone bleaching applications that can deliver cost savings and that help customers reduce their chlorine usage. We offer expertise in the development, engineering and manufacturing of vacuum pressure swing adsorption (VPSA) oxygen generation systems, which, in conjunction with ozone, are integral to pulp bleaching.

Applications Ozone bleaching is usually conducted in medium consistency pulp and at a relatively low pH. The pulp is first acidified to the desired pH level, then transferred by an MC pump through an MC/high shear mixer to an ozone reactor. Ozone is introduced into the pulp just before, or at the mixer, commonly in dosages of 0.5 to 1.0%. The mixer ensures intimate mixing between the pulp fiber and the ozone gas. At the ozone reactor, spent gas is separated from the pulp, and the pulp continues for further processing. The spent gas is discharged to an ozone destruction unit. The oxygen-rich spent gas is then exhausted to the atmosphere or recovered for other processes in the mill.

- Benefits**
- Chlorine and chlorine dioxide are replaced
 - AOX is reduced or eliminated
 - BOD/COD is lowered and effluent color is reduced
 - Higher process water recycling rates can be achieved
 - An important bleaching step towards TCF or ECF pulp production and mill closure