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Energy

Process Economics Program® (PEP)

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Hydrogen Peroxide

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Glossary

$	Dollars
$/(ton/y)	Dollar per metric ton per annum hydrogen peroxide production capacity
$/h	Dollars per hour
¢/kg	Dollar cents per kilogram
¢/lb	Dollar cents per pound
AHQ	Anthrahydroquinone
AO	Autoxidation
AQ	Alkylanthraquinone
bara	Bar absolute
barg	Bar gauge
BLI	Battery limits investment
BFW	Boiler feedwater
bhp	Brake horsepower
capex	Capital expenditure
ChW	Chilled water
CW	Cooling water
dia	Diameter
EAQ	2-ethylanthraquinone
EAHQ	2-ehtylanthrahydroquinone
EMEA	Europe, the Middle East, and Africa
FOB	Freight on board
gal	Gallons
gpm	Gallons per minute
G&A	General and administrative
h	Hours
kcal	Kilocalorie
kta	Thousand metric tons per annum
kg/h	Kilograms per hour
kg/kg	Kilogram per kilogram
kW	Kilowatts
kWh	Kilowatt-hours
lb/h	Pounds per hour
lb/lb	Pounds per pound
lb/y	Pounds per year
LHSV	Liquid hourly space velocity
m^3	Cubic meter
MMBtu	Millions British thermal units
MMBtu/h	Million British thermal units per hour
MMlb/y	Million pounds per year
Mlb/h	Thousand pounds per hour
MW	Molecular weight
opex	Operating expenditure
PEP	Process Economics Program
psig	Pounds per square inch gauge
RDC	Rotating disc contactor
RTO	Regenerative thermal oxidizer
ROI	Return on investment
sq ft	Square feet
STM	Steam
t	Metric ton
TFC	Total fixed capital
THAQ	Tetrahydroanthraquinone
THEAQ	Tetrahydroethylanthraquinone
THEAHQ	2-ethyl-5,6,7,8-tetrahydroanthra-hydroquinone
TOP	Tris(2-ethylhexyl) phosphate

USGC	US Gulf Coast
WS	Working solution
wt%	Weight percent
WWT	Wastewater treatment
y	Year

Abstract

The conventional anthraquinone autoxidation (AO) process remains the global standard for hydrogen peroxide production. This process involves the catalytic hydrogenation of alkylated anthraquinones to their corresponding anthrahydroquinones, which are subsequently oxidized to regenerate the parent anthraquinone and produce hydrogen peroxide. This review presents an updated technoeconomic evaluation of the conventional anthraquinone AO process for hydrogen peroxide production based on new patents and other publications. We last evaluated this process in PEP Report 68B (published in 1992) for hydrogen peroxide at a plant with a capacity of 20,400 metric tons per year (45 million pounds per year). This review presents the estimated operating expenditure (opex) and capital expenditure (capex), along with the process flow diagram (PFD), material balance, and major equipment list with specifications, for a standalone 220,000 metric tons per day (440 million pounds per year) hydrogen peroxide plant based on the anthraquinone process. This is Process Economics Program's (PEP) independent assessment based on information presented in open literature, such as patents or technical articles, and may not reflect in whole or in part the actual plant configuration. It is believed that these sources are sufficient to represent the process and process economics within the range of accuracy necessary for the economic evaluation of the conceptual process design of this technology.

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