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Waste Treatment Costs for Non-Phosgenation Based Polycarbonate Production

PEP Review 2019-04

January 2020

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Process Economics Program

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Abstract

This review provides definition and detailed analysis of waste treatment operations required to meet environmental discharge requirements for Asahi Kasei's non-phosgenation based polycarbonate (PC) process. The amount and compositions of all waste streams potentially generated by the PC process are considered with sizing and costing of treatment units for liquid, gaseous, and solid waste.

Wastewater treatment (WWT) typically accounts for 60–80% of total waste treatment capital requirements in most petrochemical conversion processes. In the present case, WWT costs amount to 71% of total fixed capital (TFC). While most of the liquid and gaseous waste chemicals are incinerated in this process, we find that the simple incineration system is inexpensive compared to the multi-section process required for WWT.

The waste treatment costs estimated herein are compared with the capital costs estimated for a PC process using Asahi Kasei's technology at a plant capacity of 260 ktpa. In this explicit analysis, we find that waste treatment accounts for 16% of total TFC for the PC plant. This result is within our less rigorous but traditional estimation guidelines, which have ranged from about 5 to 30% of TFC. But the waste treatment costs estimated in this explicit analysis are much higher than the traditional default estimate, which typically amounts to 5% of BLI and is often taken as the combined costs of liquid, gas, and solid waste treatment facilities for petrochemical plants.

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Glossary

lb	Pounds
m	Meters
m^3	Cubic meters
M	Thousand (prefix for English units), Mega (million prefix for metric units)
MACFM	Thousand actual cubic feet per minute
MB	Medium boilers
MBBR	Moving bed bioreactor
MBR	Membrane bioreactor
MEG	Monoethylene glycol
MeOH	Methanol
Mgal	Thousand gallons
min	Minutes
Mlb	Thousand pounds
MLVSS	Mixed liquor volatile suspended solids, weight per volume microbiological suspension
mm	Millimeters
MM	Million (prefix for English units)
MMBtu	Million British thermal units
mol	Moles
mol%	Molar percent
MPa	Megapascals
MPC	Methylphenyl carbonate
MSCF	Thousand standard cubic feet
MSCFH	Thousand standard cubic feet per hour
MW	Megawatts or Molecular weight
NDIR	Non-dispersive infrared, a type of sensor, used to measure carbon oxide concentrations
NTA	Nitrilotriacetic acid
OSBL	Outside Battery Limits
PC	Polycarbonate
PEP	Process Economics Program
PFD	Process flow diagram
PhOH	Phenol
ppb	Parts per billion
ppm	Parts per million
psi	Pounds per square inch
psia	Pounds per square inch absolute
psig	Pounds per square inch gauge
RO	Reverse osmosis
ROI	Return on investment
S, sec	Second(s)
SCF	Standard cubic feet
SCM	Standard cubic meters
Sq ft	Square feet
SRT	Solids retention time
STM	Steam

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Glossary (continued)

TDS	Total dissolved solids
TFC	Total fixed capital
TKN	Total Kjedahl nitrogen
TSS	Total suspended solids
UASB	Upflow anaerobic sludge blanket
vol%	Volume percent
WAO	Wet air oxidation
wt%	Weight percent
yr	Year
WWT	Wastewater treatment
WWTP	Wastewater treatment plant(s)
XLPE	Crosslinked polyethylene
ZLD	Zero liquid discharge

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