SK Innovation's Nexlene™ Process

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Table of contents

Tables

Figures

Appendix C Figures

Glossary

¢/lb	Cents per pound
atm	Atmospheres
BFW	Boiler feed water
Bhp	Brake horsepower
BLI	Battery limits investment
Btu	British thermal units
CAGR	Compound annual growth rate
Capex	Capital expenditure
cf/ft^3	Cubic feet
COS	Carbonyl sulfide
CS	Carbon steel
CSTR	Continuous stirred tank reactor
CTA	Chain transfer agent
CW	Cooling water
°C	Degree Celsius
DCM	Dichloromethane
Dia	Diameter
EAO	Ethyl aluminoxane
EPDM	Ethylene propylene diene monomer rubber
EPR	Ethylene propylene rubber
EVA	Ethylene vinyl acetate
FOB	Freight on board
ft	Feet
g	Grams
G&A	General and administrative
Gal	Gallons
g/cm³	Gram per cubic centimeters
gal/lb	Gallons per pound
gpm	Gallons per minute
h	Hours
HDPE	High-density polyethylene
HVAC	Heating, ventilation, and air conditioning
kg	Kilograms
kg/h	Kilograms per hour
kPag	Kilopascals gauge
kW	Kilowatts
kWh/lb	Kilowatt-hour per pound
lb/h	Pounds per hour
LAO	Linear alpha-olefins
LLDPE	Linear low-density polyethylene
MAO	Methyl aluminoxane
MDPE	Medium-density polyethylene
mgal	Thousand gallons
mHDPE	Metallocene high-density polyethylene
Mlb	Thousand pounds
Mlb/h	Thousand pounds per hour
Mlb/lb	Thousand pounds per year
MMBtu	Million British thermal units
MMBtu/h	Million British thermal units per hour
MMlb/y	Million pounds per year
mLLDPE	Metallocene linear low-density polyethylene
MMt	Million metric tons
MMt/y	Million metric tons per year
mol%	Molar percent
Mol wt.	Molecular weight
MPa	Megapascals
MPag	Megapascals gauge
NCA	non-coordinating anion
OBC	Olefin block copolymer
Opex	Operating expenditure

PE	Polyethylene
PFD	Process flow diagram
PID	Potential induced degradation
POE	Polyolefin elastomer
POP	Polyolefin plastomers
PP	Polypropylene
psi	Pounds per square inch
psia	Pounds per square inch absolute
psig	Pounds per square inch gauge
PV	Photovoltaic
PVC	Polyvinyl chloride
PVDF	Polyvinyl difluoride
ROI	Return on investment
s	Second(s)
SBCs	Styrene-block copolymers
SCB	Short-chain branching
scf	Standard cubic feet
scm	Standard cubic meter
sq ft	square feet
SS	Stainless steel
SSNC	SABIC SK Nexlene Company
t	Metric ton
t/t	Metric tons per metric ton
t/y	Metric tons per year
TFC	Total fixed capital
TIBA	Triisobutylaluminum
TOR	Tons of refrigeration
TPMAB	Triphenylmethylanilinium tetrakis(pentafluorophenyl)borate
ULDPE	Ultra-low-density polyethylene
USGC	United States Gulf Coast
V/L	Vapor-liquid
VLDPE	Very-low-density polyethylene
vol%	Volume percent
wt%	Weight percent
w/w	Weight for weight

Abstract

The novel Nexlene™ technology combines a bimodal solution technique with a unique metallocene catalyst to produce cutting-edge ethylene copolymers with optimized molecular weight distribution and modality. Nexlene™ solution process technology offers products with excellent impact strength, enhanced toughness, and superior transparency, and it is already being used to manufacture flexible food packaging and wrapping materials. POE are transforming industries ranging from automotive to solar power because of their superior performance and adaptability. Manufacturers of products that require elasticity, like footwear, cables, and vehicles, will also gain important advantages from POE. POE have attracted interest due to their low density, resistance to chemicals, advantages in processing, strong resilience without permanent deformation, uses in recycling plastic, and comparatively lower cost.

This research focuses on the technical and economic aspects of producing commercial-grade POE from ethylene and 1-octene (32.7 wt%) utilizing a process similar to Nexlene™ process, with a total plant capacity of 661.5 MMlb/y (300,000 t/y). This assessment includes a process flow diagram, a material balance, a list of major equipment with specifications, cost information for battery limits and offsites, variable costs, capital expenditure (capex), operating expenditure (opex), and overall production costs. The accompanying iPEP Navigator, an excel-based interactive module (available with the electronic version of this report), allows the user to compare the processes in different regions of interest, times, and units (English or metric).

The analysis is based on information given, by the technology providers, in open literature (such as patents or technical articles) or in-house generated data (e.g., HYSYS simulation and equipment cost estimation). While this assessment may not reflect the actual plant data fully, we do believe that it is sufficiently representative of the process and process economics within the range of accuracy necessary for economic evaluations of a process design.

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