



NYLON 66 CHIPS FROM ADIPIC ACID AND HEXAMETHYLENEDIAMINE

Geography: China, Shanghai, Product: NYLON 66 CHIPS, PEP Cost Index: 1094, Price: 238.32 €/KG, Code: 4M-901, Location Factor: 0.73 (1US \$ = 6.66), Data version: 2016 Q3

Cost of raw material, by-product and utilities

	Unit Cost	Unit Consumption per TONNE	Product Cost €/KG
RAW MATERIALS			188.65
ACETIC ACID	27.91 €/KG	0.00175 TONNE	0.05
ADIPIC ACID	120 €/KG	0.6535 TONNE	78.42
HEXAMETHYLENEDIAMINE	211.97 €/KG	0.5198 TONNE	110.18
UTILITIES			18.01
COOLING WATER	3.38 €/M3	187.772 M3	0.63
ELECTRICITY	7.23 €/KWH	88.1849 KWH	0.64
FUEL OIL	2.38 €/MMCAL	1839.44 MMCAL	4.38
INERT GAS	6.16 €/NM3	1565.15 NM3	9.64
PROCESS WATER	22.14 €/M3	2.37009 M3	0.05
STEAM	1146.4 €/TONNE	2.33 TONNE	2.67

PROCESS DESCRIPTION

Nylon 66 chips are made by first reacting hexamethylenediamine and adipic acid in water to form nylon salt (hexamethylenediammonium adipate). The aqueous nylon salt solution is concentrated by evaporation and then reacts in three continuous reaction stages: pressure heating with water removal in a tubular exchanger (with addition of acetic acid to control molecular weight), gradual pressure release in a long tubular reactor, and heating under vacuum. The final nylon 66 melt is extruded and pelletized to form chips. Depending upon the grade, various additives (not listed above) may be added. The yield is 97% of theoretical on both adipic acid and hexamethylenediamine. The process may be similar to one used by DuPont.

REFERENCE:

[PEP Report 54A P.94-97 \(YCY\)](#)

Process Economics 05-03-2017

2016 Q3 data

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Overall cost structure

	Capacity (THOUSAND TONNE / year)		
	11.34	22.68	45.36
INVESTMENT, US\$ MILLION	26.53	39.38	62.66
BATTERY LIMITS	13.23	18.45	27.39
OFF SITES	13.30	20.93	35.27
PRODUCTION COSTS, US €/KG			
RAW MATERIALS	188.65	188.65	188.65
BY PRODUCT CREDITS	0.00	0.00	0.00
UTILITIES	18.01	18.01	18.01
VARIABLE COSTS	206.66	206.66	206.66
MAINTENANCE MATERIALS	2.80	1.95	1.45
OPERATING LABOR (8.0/SHIFT)	10.35	5.17	2.59
OPERATING SUPPLIES	2.07	1.03	0.52
MAINTENANCE LABOR	1.87	1.30	0.97
CONTROL LABORATORY	3.62	1.81	0.91
TOTAL DIRECT COSTS	227.37	217.92	213.1
PLANT OVERHEAD	19.01	9.94	5.36
TAXES AND INSURANCE	2.34	1.74	1.38
PLANT CASH COSTS	248.72	229.6	219.84
DEPRECIATION	23.40	17.36	13.81
PLANT GATE COST	272.12	246.96	233.65
G + A, SALES, RES., 15.00 %	54.21	48.18	44.89
PRODUCTION COSTS			
AT 100% CAPACITY	326.33	295.14	278.54
AT 75% CAPACITY	366.22	324.63	302.50
AT 50% CAPACITY	446.00	383.62	350.42
PRODUCT VALUE (COST + 15.00 %/YR ROI BEFORE TAXES), US €/KG			
AT 100% CAPACITY	361.42	321.18	299.26
AT 75% CAPACITY	413.01	359.36	330.13
AT 50% CAPACITY	516.19	435.71	391.86