

## Nelson's Complexity Factor

In the Refining Industry, a common index termed as "EDC" - Equivalent Distillation Capacity is defined to calculate the benchmark of manpower requirement.

Calculation of EDC is a two-step process. The first step is the multiplication of the capacity of each unit in the refinery with the Nelson's complexity factor and the second is the sum of these products to arrive at the EDC for the refinery in total.

### Nelson Complexity Index

Nelson Complexity Index is a measure of secondary conversion capacity in comparison to the primary distillation capacity of any refinery. It is an indicator of not only the investment intensity or cost index of the refinery but also the value addition potential of a refinery.

The index was developed by Wilbur L Nelson in 1960 to originally quantify the relative costs of the components that constitute the refinery. Nelson assigned a factor of one to the primary distillation unit. All other units are rated in terms of their costs relative to the primary distillation unit also known as the atmospheric distillation unit.

Following are the factors for the various Processing Units :

Unit	Nelson's Complexity Index	
	Older Reports	1998 Reports
Distillation Capacity	1.0	1.0
Vacuum Distillation	2.0	2.0
Thermal Processes	5.0	2.75
(Categories 1 and 2 - 2.75)		
(Categories 3 to 5 - 6.00)		
Coking		6.0
Catalytic Cracking	6.0	6.0
Catalytic Reforming	5.0	5.0
Catalytic Hydrocracking	6.0	6.0
Catalytic Hydrorefining	3.0	3.0
Alkylation / Polymerization	10.0	10.0
Aromatics / Isomerisation	15.0	15.0
Lubes	60.0	60.0
Asphalt	1.5	1.5
Hydrogen (Mcf/d)	1.0	1.0
Oxygenates	10.0	10.0

(MTBE / TAME)

Thermal Operations

Thermal Cracking	3.0
Visbreaking	2.5
Fluid Coking	6.0
Delayed Coking	6.0
Others	6.0

The Nelson Complexity Index method uses only the Refinery Processing Units or the " Inside Battery Limits " ( ISBL ) Units, and does not account for the costs of Off-sites and Utilities or the " Outside Battery Limits " ( OSBL ) Costs, such as Land, Storage tanks, terminals, utilities required etc.

The Nelson Complexity Index provides insight into refinery complexity, replacement costs and the relative value addition ability and allows different refineries to be ranked.

The Nelson Complexity Index for the Reliance refinery is 9.93 and for the overall Jamnagar Complex is over 14.0.

Essentially a high Nelson Complexity Index as the Reliance Jamnagar Refinery is, points to the following characteristics .

- Ability to process inferior quality crude or heavy sour crudes. For example the Jamnagar Refinery generally processes crudes which are 5°API lower and 0.7wt% sulphur higher compared to Indian peers.
- Ability to have a superior refinery product slate comprising of high percentage of LPG, light distillates and middle distillates and low percentage of heavies and fuel oil. For example the Jamnagar Refinery produces no fuel oil which is unmatched by the Indian peers.
- Ability to make high quality refinery products such as Bharat 3 gasoline or diesel. For example the Jamnagar Refinery can make Euro 3 grade gasoline unmatched by the Indian peers.