

Short-Cut Distillation

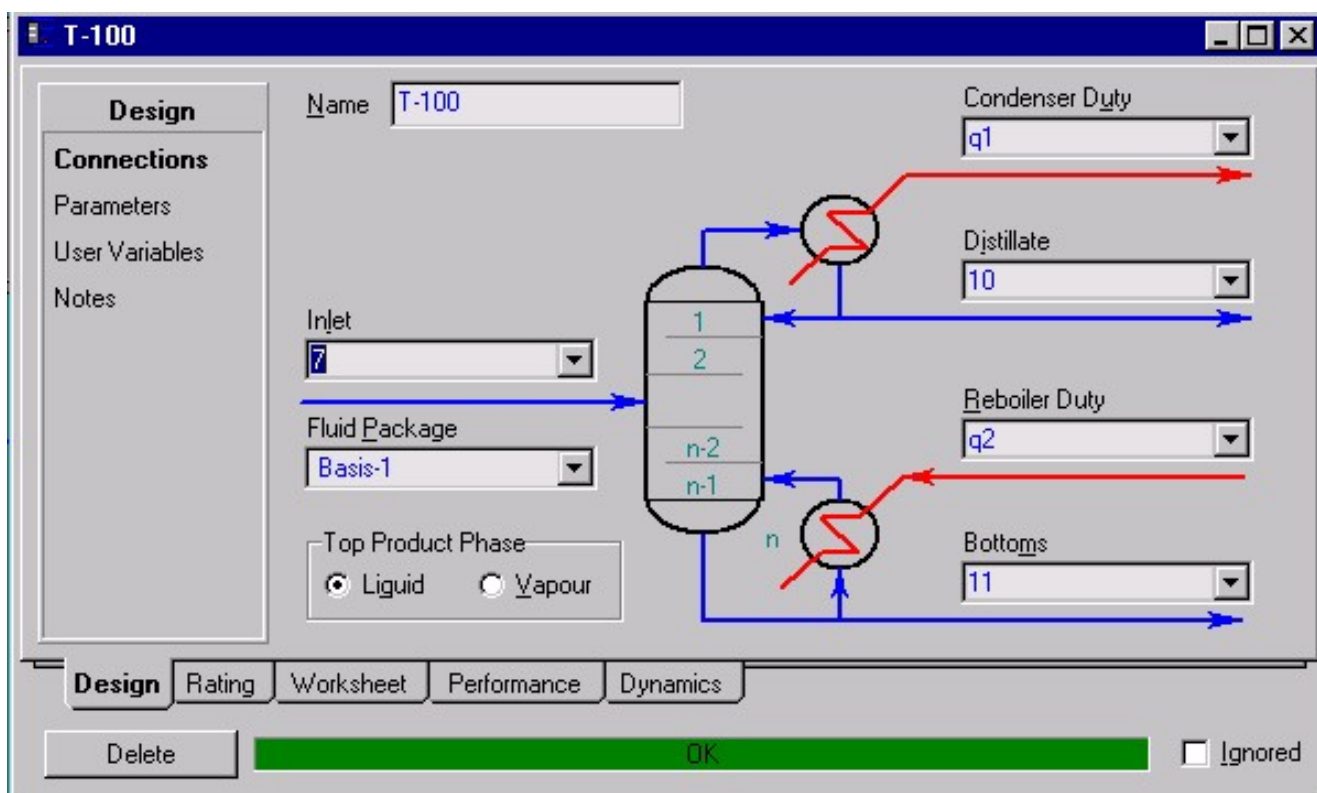
Όταν θέλουμε να προσδιορίσουμε ελάχιστο και θεωρητικό αριθμό βαθμίδων και ελάχιστο λόγο αναρροής χρησιμοποιούμε την στήλη SHORT CUT. Το UNISIM εφαρμόζει την μέθοδο Fenske Underwood Gilliland.

Παρέχει εκτιμήσεις για :

- Ελάχιστο αριθμό δίσκων κατά Fenske
- Ελάχιστο λόγο αναρροής κατά Underwood
- Θεωρητικό αριθμό δίσκων (βαθμίδων) κατά Gilliland
- Ενεργειακά Φορτία Αναβραστήρα και Συμπυκνωτή
- Βέλτιστη θέση τροφοδότησης
- Μέση ροή ατμού και υγρού στο τμήμα εμπλουτισμού (rectify) (V, L) και στο τμήμα εξάντλησης (stripping) ($\bar{V}, \bar{L}$)

Διαμόρφωση στήλης SHORT CUT

1. Προσθήκη ρευμάτων μάζας (7,10,11 στην εικόνα) και ενέργειας (q_1, q_2 στην εικόνα) (Tab Connections)



2. Μεταβλητές σχεδιασμού (Tab **Parameters**)

- Light Key in Bottom – Εισάγεται το γραμμομοριακό κλάσμα του πιο πτητικού συστατικού στον πυθμένα της στήλης (ρεύμα)
- Heavy Key in Distillate – Εισάγεται το γραμμομοριακό κλάσμα του λιγότερου πτητικού συστατικού στο απόσταγμα
- Εισάγονται τιμές για τις πιέσεις συμπυκνωτή (condenser) και αναβραστήρα (reboiler)

- Εισάγεται η τιμή του επιθυμητού λόγου αναρροής (Reflux Ratio)

Όταν υπάρχει λύση → πράσινο (OK)

T-100

Design

Connections
Parameters
User Variables
Notes

Components

Component	Mole Fraction
n-Butane	0.0001
n-Hexane	0.0001

Pressures

Condenser Pressure	8.000 bar
Reboiler Pressure	8.200 bar

Reflux Ratios

External Reflux Ratio	2.000
Minimum Reflux Ratio	0.225

Design Rating Worksheet Performance Dynamics

Delete OK Ignored

3. Τα αποτελέσματα παρουσιάζονται στο Tab Performance

T-100

Performance

Trays

Minimum Number of Trays	10.785
Actual Number of Trays	13.675
Optimal Feed Stage	7.251

Temperatures

Condenser [C]	39.47
Reboiler [C]	168.8

Flows

Rectify Vapour [kgmole/h]	8.644
Rectify Liquid [kgmole/h]	5.763
Stripping Vapour [kgmole/h]	8.644
Stripping Liquid [kgmole/h]	13.919
Condenser Duty [kJ/h]	-197806.697
Reboiler Duty [kJ/h]	253703.365

Design Rating Worksheet Performance Dynamics

Delete OK Ignored

A. SHORT CUT METHOD (FENSKE UNDERWOOD GILLILAND)

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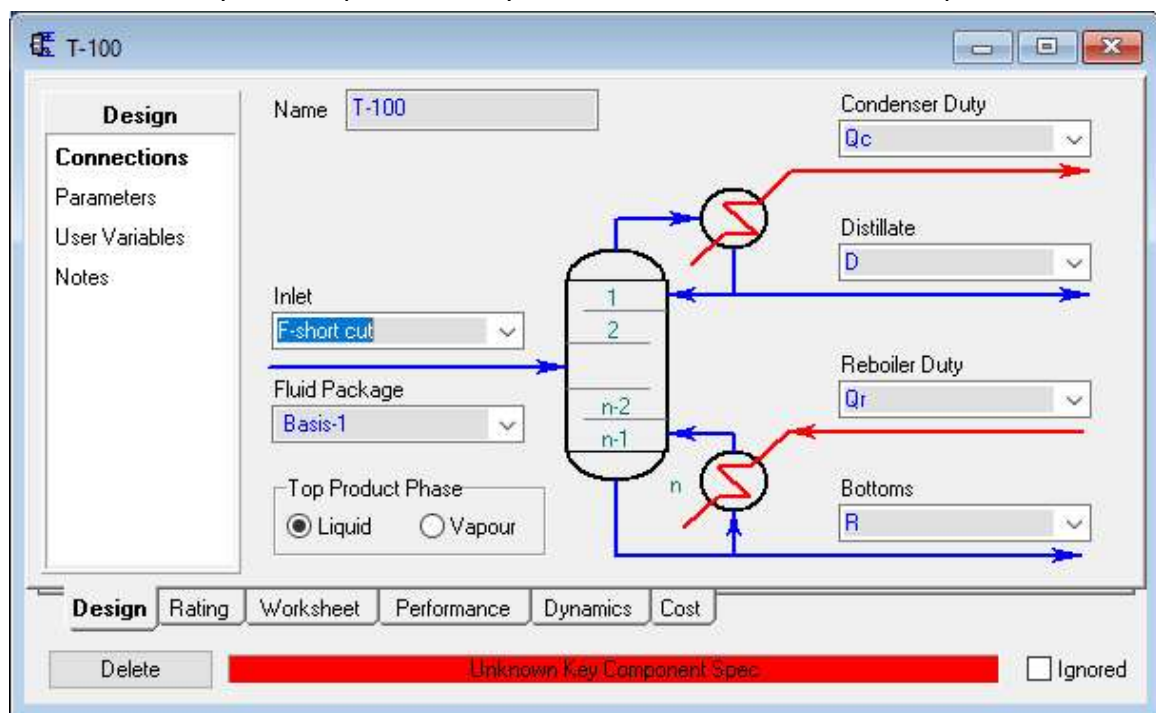
A. SHORT CUT METHODS (FENSKE UNDERWOOD GILLILAND)

1. Add a Short Cut Distillation Column

- Drag and Drop the **Short Cut** Distillation icon  from the Object Palette.
- Double-click the **Short Cut** Distillation icon .
- The **Short Cut** Distillation property view appears

2. Specifying Short Cut Column connections

- Click on the Design tab.
- Click on the Connections page.
- In the Name field, specify a name for the Short Cut Column. (Optional)
- In the Inlet drop-down list either type in the name of the stream or if you have pre-defined your stream select it from the drop-down list.
- In the Condenser Duty drop-down list either type in the name of the stream or if you have pre-defined your stream select it from the drop-down list.
- In the Reboiler Duty drop-down list either type in the name of the stream or if you have pre-defined your stream select it from the drop-down list.
- In the Bottoms drop-down list either type in the name of the stream or if you have pre-defined your stream select it from the drop-down list.
- In the Top Product Phase group, click either the Liquid or Vapour radio button.
- In the Distillate drop-down list (when the Liquid radio button is selected) or the overhead Vapour drop-down list (when the Vapour radio button is selected) either type in the name of the stream or if you have pre-defined your stream select it from the drop-down list.



3. Specifying Short Cut Column parameters

- Click on the Parameters page.
- In the Light Key in Bottoms Component drop-down list, select the component you want to define as the light key.
- Specify the Mole Fraction of the light key in the Light Key in Bottoms Mole Fraction field.

- In the Heavy Key in Distillate Component drop-down list, select the component you want to define as the heavy key.
- Specify the Mole Fraction of the heavy key in the Heavy Key in Distillate Mole Fraction field.
- Specify the condenser and reboiler pressures in the appropriate fields in the Pressures group.
- Specify the external reflux ratio in the External Reflux Ratio field. The External Reflux must be greater than the Minimum Reflux Ratio.

The screenshot shows the 'T-100' design window with the 'Design' tab selected. The left sidebar contains 'Design', 'Connections', 'Parameters', 'User Variables', and 'Notes'. The main area is divided into three sections: 'Components', 'Pressures', and 'Reflux Ratios'.

Components:

Component	Mole Fraction
Light Key in Bottoms	Methanol 0.0100
Heavy Key in Distillate	H2O 0.0100

Pressures:

Condenser Pressure	1,500 bar
Reboiler Pressure	1,500 bar

Reflux Ratios:

External Reflux Ratio	0.800
Minimum Reflux Ratio	0.690

At the bottom, there are tabs for 'Design', 'Rating', 'Worksheet', 'Performance', 'Dynamics', and 'Cost'. Below the tabs are 'Delete', 'OK', and 'Ignored' buttons.

4. Viewing Short Cut Column Results

- Click on the Performance tab.

The **Performance** tab contains the following groups:

- The Trays group displays the following results: [Minimum Number of Trays](#), [Actual Number of Trays](#), and [Optimal Feed Stage](#).
- The Temperatures group displays the following results: [Condenser Temperature](#) and [Reboiler Temperature](#).
- The Flows group displays the following results: [Rectify Vapour](#), [Rectify Liquid](#), [Stripping Vapour](#), [Stripping Liquid](#), Condenser Duty, and Reboiler Duty.

[Minimum Number of Trays](#): This is the Fenske minimum number of trays, which is not affected by the External Reflux Ratio specification

[Actual Number of Trays](#): This is calculated using a using the Gilliland method

[Optimal Feed Stage](#) Top down feed stage for optimal separation

[Rectify Vapour](#), [Rectify Liquid](#): These are the estimated average flow rates above the feed location

[Stripping Vapour](#), [Stripping Liquid](#): These are the estimated average flow rates below the feed location