

## **Texas Gulf Coast Engineers**

### **Procedure for Partial Replacement of Coke Drum Cones as Required for the Installation of Coke Drum Unheading Valves**

This procedure describes methods to dimensionally capture and model a coke drum cone section and electronically trial fit a new partial cone section that will facilitate the installation of a new unheading device. The trial fit will verify that the new partial cone is fabricated as required to achieve proper alignment with the existing cone and provide the space/positioning requirements of the new unheading device.

# Procedure for the Replacement of Coke Drum Cones to Facilitate the Installation of Unheading Valves

## Background and Need

Coke drum unheading in general can be explained as follows: When coke is being formed in the coke drum, the unheading device is the means of isolating the drum. After the coking process is complete, the unheading devices (at top and bottom of the drum) are opened by hydraulic or other means, the coke formed is separated from the drum (decoking) and is further handled and conveyed. The drum is again ready for coking and the unheading devices are closed. The process of coking and decoking are batch processes and take place over a period of roughly 24 hours. Approximately 20 hours is required for coking and 2 to 3 hours for decoking. Unheading devices provide significant safety and performance advantages over traditional manual unheading.

## Purpose

When installing an unheading device on an existing coke drum, the cone section will require modification (reduction in length) to provide space for the unheading device while maintaining the elevation and orientation required for connection to existing coker piping. By removing part of the existing cone and replacing it with a new cone section with an increased slope, the new unheading device can be installed at the correct elevation and position for fit-up with existing coker piping.

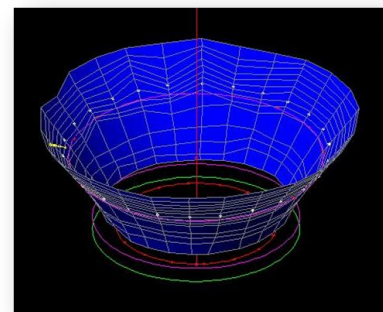
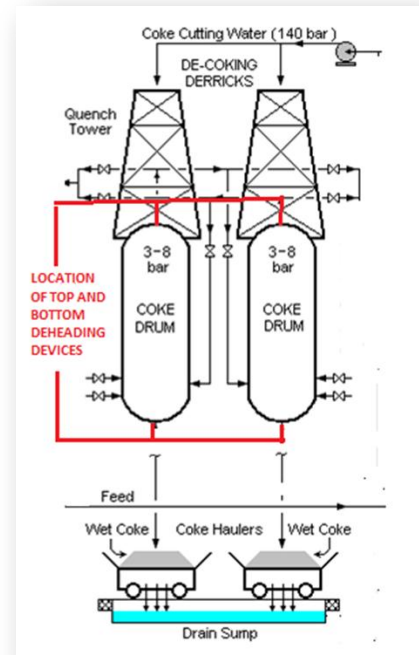
This procedure describes the TGCE methods utilized to dimensionally capture and model an existing coke drum cone section and to electronically trial fit a new partial cone section that will facilitate the installation of an new unheading device. This trial fit will verify that the new partial cone is fabricated correctly or identify any dimensional revisions required to achieve the best possible alignment of all mating surfaces in the minimum amount of time.

The field contractor will also receive installation documents and construction field support to ensure that other dimensional issues surrounding the removal of the existing cones and the staging of the new cones for installation are well understood and are resolved before shutdown.

## Dimensional Verification of Existing Cones

Laser total station measurements combined with photogrammetric methods are used for the capture of the dimensional data required to generate a 3D model of the existing coke drum cone. Data is collected at designated intervals with the drum in the cold position. After model development, horizontal sections are taken through the model at the proposed cut line, and at given intervals above and below the proposed cut line to produce a circumferential profile of the cone at various elevations.

The model is also used to analyze the cone for roundness giving special attention to any bulges or indentations occurring in the cone



Model of Existing Cone

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profile that may affect fit-up. These deviations are commonly caused by fabrication tolerances, creep and thermal cycling of the cones.

Dimensional data collected at the bottom flange is also included in the model. The bottom flange is checked for level and centering with the cone sections using the model. The proposed cut line is then adjusted to take advantage of the most uniform cut through the cone with respect to roundness. Flange elevation and best fit of the new to the existing component are also considered when selecting the optimum cutline elevation.

The model is then utilized to produce fabrication drawings of the replacement cone that will precisely reflect the true geometry of the existing cone and facilitate fit-up with the unheading device and associated piping.

## Dimensional Verification of Fabricated Cones

After fabrication, the same methods described above are used to capture the dimensional data required to generate a 3D model of the new fabricated cone. The fabricated cone geometry will differ from the fabrication drawings and the existing cone as a result of shop tolerances and any dimensional errors occurring in the fabrication process.

Horizontal sections are taken through the fabricated model at the proposed cut line, and at given intervals above and below the proposed cut line as described above. Center lines for each profile are also determined.



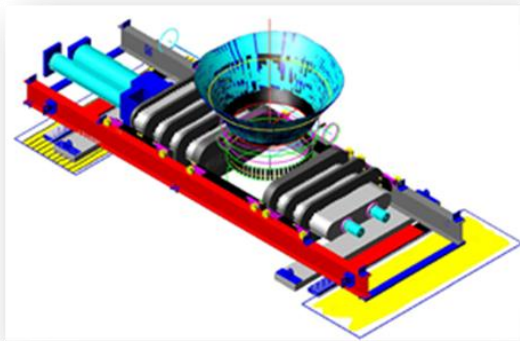
**Fabricated Replacement Cone**

## Model Comparison and Cutline Adjustment

The data collected of the fabricated cone is analyzed for roundness at the various elevations and compared to the corresponding elevation profiles of the existing cone. The 3D model of the existing cone and the 3D model of the new fabricated cone are overlaid in model space to find the optimum cutline elevation for the existing cone and the trim cutline for the fabricated cone section.

## Deliverables

Deliverables will include the documentation required for the layout of the cutline on the existing cone and the trim cutline on the fabricated cone. Drawings will also reflect layout and indexing of any nozzles and attachments. As part of every project, **TGCE will assist the field contractor in the layout of all cut-lines and provide assistance for the resolution of any and all dimensional issues.** TGCE's comprehensive work process provides all inclusive dimensional support for every phase of your project and is not available from any other contractor.



**Model of New Cone and Unheading Device**



**Completed Unheading Device Installation**