

THERMAL STRESSES DEFORMATION OF RADIANT TUBES FOR ETHANE CRACKING SERVICE IN A PETROCHEMICAL INDUSTRY: CASE STUDY

I. M. Kamal, A. A. Al-Hajaj and A. A. Jasim
Chi. Eng. Dept., College of Eng., Basrah Univ., Basrah-Iraq.
M. S. Abdul-Hassan, J. A. Iscander and M. T. Hnaiaan
State Company for Petrochemical Industries, Basrah-Iraq

ABSTRACT

Causes of deformation of direct-fire vertical radiant tubes of box type heater for ethane cracking in polyethylene industry were investigated using visual, and mechanical tests. It was found that the main cause of such deformation was due to thermal stresses. Optimization of the operating conditions; fluid temperature, excess air percent and fuel gas flow rate using the reverse engineering principles were made to control causes of such deformation. The effects of the operating conditions on reaction kinetics and conversion were investigated and discussed.

NOTATIONS

ΔH_r = heat of reaction

ϕ_i = residence time

A_c = reactor sectional area (m^2)

\bar{p} = Average ethane partial pressure

C_p = specific heat

d = pipe diameter (m)

F = molar flow rate

k = rate constant

l = reactor length.

p = ethane partial pressure

Q = volumetric flow rate

R = gas constant

T = temperature

U = overall heat transfer coefficient

V = volume of reactor

x = conversion

x_o = conversion at coil outlet