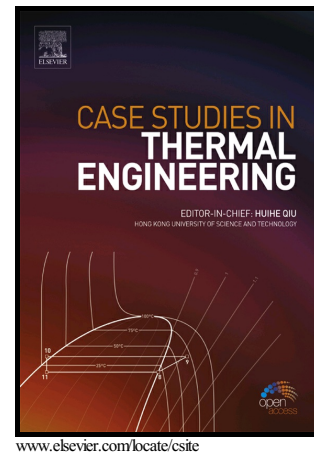


## Author's Accepted Manuscript

Heat Transfer Phenomena on Waste Heat Recovery of Combustion Stack Gas with Deionized Water in Helical Coiled Heat Exchanger

Rithy Kong, Thoranis Deethayat, Attakorn Asanakham, Tanongkiat Kiatsiriroat



PII: S2214-157X(17)30307-6  
DOI: <https://doi.org/10.1016/j.csite.2018.04.010>  
Reference: CSITE281

To appear in: *Case Studies in Thermal Engineering*

Received date: 27 November 2017

Revised date: 29 March 2018

Accepted date: 9 April 2018

Cite this article as: Rithy Kong, Thoranis Deethayat, Attakorn Asanakham and Tanongkiat Kiatsiriroat, Heat Transfer Phenomena on Waste Heat Recovery of Combustion Stack Gas with Deionized Water in Helical Coiled Heat Exchanger, *Case Studies in Thermal Engineering*, <https://doi.org/10.1016/j.csite.2018.04.010>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

# Heat Transfer Phenomena on Waste Heat Recovery of Combustion Stack Gas with Deionized Water in Helical Coiled Heat Exchanger

Rithy Kong<sup>1</sup>, Thoranis Deethayat<sup>2\*</sup>, Attakorn Asanakham<sup>2</sup>, Tanongkiat Kiatsiriroat<sup>2</sup>

<sup>1</sup>Energy Engineering Program, Faculty of Engineering and Graduate School, Chiang Mai University

<sup>2</sup>Thermal System Research Laboratory, Department of Mechanical Engineering, Faculty of Engineering, Chiang Mai University.

## ABSTRACT

Theoretical and experimental studies on waste heat recovery of combustion stack gas and heat transfer phenomena of a fully developed laminar flow of deionized water in vertical helical coils were carried out with coil dimensions: tube diameter to coil diameter,  $d_i/D = 0.04 - 0.06$  and pitch to coil diameter,  $p/D = 0.1 - 0.25$ . The calculation of heat transfer data was based on countercurrent flow LMTD method. The result showed that deionized water (DI-water) possessed better heat transfer than that of normal water. The effect of coil pitch, coil diameter, and coiled tube diameter on heat transfer phenomena of helical coils had been discussed and a new set of correlation of heat transfer data was created and it could be found that the results from the correlation agreed well with the experimental data. In addition, the overall heat transfer coefficient between the hot exhaust gas and the heat transfer fluid in the helical coil was also considered. Smaller tube diameter gave better overall heat transfer coefficient at low water-side Reynolds number and when the Reynolds number was over 3,500 the bigger tube diameter showed the advantage. Smaller coil diameter seemed to get better overall heat transfer coefficient at low water-side Reynolds number.

**Keywords:** Waste heat recovery, Helical coil, Heat transfer data, Deionized water

## Nomenclature

LMTD log-mean temperature difference

HTF heat transfer fluid

$d$  coiled tube diameter

$p$  coil pitch

$D$  coil diameter

$Re$  Reynolds number

$Pr$  Prandtl number

$Dn$  Dean number,  $Dn = Re(d/D)^{1/2}$

$Nu$  Nusselt number

$R$  thermal resistance

$T$  temperature

$C_p$  specific heat

Download English Version:

<https://daneshyari.com/en/article/7153284>

Download Persian Version:

<https://daneshyari.com/article/7153284>

[Daneshyari.com](https://daneshyari.com)