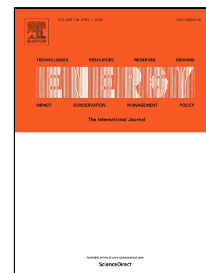


# Accepted Manuscript

Optimal retrofitting of natural gas pressure reduction stations for energy recovery

Ermanno Lo Cascio, Marc Puig Von Friesen, Corrado Schenone



PII: S0360-5442(18)30601-7  
DOI: 10.1016/j.energy.2018.04.011  
Reference: EGY 12650  
To appear in: *Energy*  
Received Date: 13 December 2017  
Revised Date: 17 March 2018  
Accepted Date: 03 April 2018

Please cite this article as: Ermanno Lo Cascio, Marc Puig Von Friesen, Corrado Schenone, Optimal retrofitting of natural gas pressure reduction stations for energy recovery, *Energy* (2018), doi: 10.1016/j.energy.2018.04.011

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 proof before it is published in its final 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.

# Optimal retrofitting of natural gas pressure reduction stations for energy recovery

Ermanno Lo Cascio<sup>a</sup>, Marc Puig Von Friesen<sup>b</sup>, Corrado Schenone<sup>a,\*</sup>

<sup>a</sup> DIME - Dipartimento di Ingegneria Meccanica, Energetica, Gestionale e dei Trasporti, Università degli Studi di Genova, via All'Opera Pia 15/A, 16145, Genova.

<sup>b</sup> SP Technical Research Institute of Sweden, box 857, SE-501 15, Borås, Sweden.

\* Author to whom correspondence should be addressed. E-Mail: corrado.schenone@unige.it

**keywords:** natural gas pressure reduction stations; energy recovery; optimal design; system thermal integration; turbo expander; district heating

## Highlights

- A novel comprehensive approach for pressure reduction stations retrofitting based on structured procedure.
- An optimization model enabling the maximum energy recovery in natural gas pressure reduction stations.
- Turbo-expander size defining the recovery potential and leading to non-smooth constrained optimization.
- Optimal design of natural gas expansion process for thermal integration with low-temperature processes.

## Abstract

In this paper, a structured retrofitting approach (SRA) to the near-optimal design of natural gas (NG) pressure reduction stations (PRSs) is presented. The SRA is designed by considering the waste energy recovery, system integration opportunities and long-term-based objectives to successfully address the entire PRS retrofitting process. The SRA is developed in four phases: pre-retrofit activities, preliminary and executive project design, implementation and commissioning and post-retrofit activities. For design optimization during the preliminary and executive project design phase, a novel mathematical model was developed based on the minimization of the levelized cost of energy (LCOE). The optimization model consists of a non-smooth constrained problem that has been solved by means of different solution methods and has been tested for different thermal peak loads, fuel purchase costs, and natural gas flow rates. Variations of the thermal design conditions from 2,900 kW to 1,300 kW for a constant annual heat demand, fluctuations of the percentage increase of the NG cost by 80-100-120-140%, and reductions of the NG user demand of 30% and 60% were considered. The results highlighted that the proposed optimization technique in PRS retrofitting identifies the best system configuration and turbo expander technology.

Download English Version:

<https://daneshyari.com/en/article/8071572>

Download Persian Version:

<https://daneshyari.com/article/8071572>

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