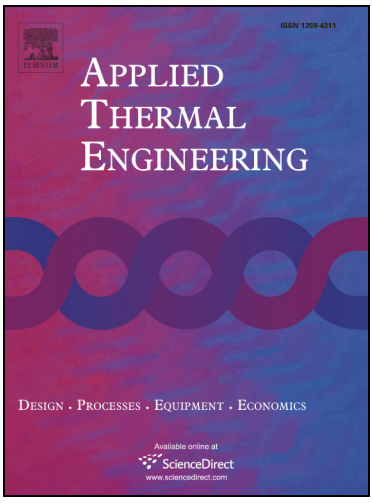

A recent review of waste heat recovery by Organic Rankine Cycle

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ABSTRACT

The increment of using fossil fuels has caused many perilous environmental problems such as acid precipitation, global climate change and air pollution. More than 50% of the energy that is used in the world is wasted as heat. Recovering the wasted heat could increase the system efficiency and lead to lower fuel consumption and CO2 production. Organic Rankine cycle (ORC) which is a reliable technology to efficiently convert low and medium temperature heat sources into electricity, has been known as a promising solution to recover the waste heat. There are numerous studies about ORC technology in a wide range of application and condition. The main objective of this paper is to presents a review of studies both theoretical and experimental on ORC usage for waste heat recovery and investigation on the effect of cycle configuration, working fluid selection and operating condition on the system performance, that have been developed during the last four years. Finally, the related statistics are reported and compared regarding the configuration and the employed working fluid with type of the heat source.

Keywords: Organic Rankine cycle, Waste heat, Working fluid, Cycle efficiency

1 Introduction

During the last decades, human dependency on energy has increased [1, 2]. Recent global oil consumption was about 76 million barrels per day [3]. This situation can lead to various challenges such as acid precipitation [4], ozone layer depletion [5], and global climate change and air pollution [6], while the global energy resources continue to decrease [7]. There were two main approaches for overcoming the environmental problems; the first is to develop and enhance the use of renewable energy sources like solar, wind [8], biomass [9], and geothermal [10]. The second approach is to find a way for enhancement of energy conversion systems so that the system efficiently uses the energy that can be received from a source [11-13]. The evidences show that more than 50% of the energy that is used in the world is wasted as heat. [1, 14]. There are various energy systems with high level of waste heat such as gas and steam turbines, internal combustion engines, industrial and household waste heat, as well as geothermal heat, biomass heat, and solar radiation as shown in fig.1 which is statistics of the type of heat sources of the recent investigations reviewed in this study [15-17].