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## Advantages of incorporating Hygroscopic Cycle Technology to a 12.5-MW biomass power plant

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### Abstract

This article focuses on the advantages found by incorporating Hygroscopic Cycle Technology into the 12.5-MWe “Vetejar” biomass power plant operating in the province of Córdoba (Spain) since 1996. The power plant required upgrades to increase its availability, net electrical performance and to extend the service life span of refrigeration equipment. The incorporation of the new Hygroscopic Cycle Technology has allowed not only to alleviate the shortcomings of the power station in a simple way, but also to make the most of the existing equipment, despite the adverse environmental conditions. The scarcity of water in the area is one of the greatest difficulties the plant has met since its start-up. It significantly diminishes the operation hours of the plant, reducing the electrical power generated, electrical performance and availability. The incorporation of this novel technology to the existing plant has allowed the cooling temperature to increase by 13°C while maintaining the same condensing pressure. As a result, significant net increase in electrical efficiency, reduction of auto-consumption and cut down on annual cooling water consumption were obtained.

**Keywords:** Rankine cycle; Efficiency; Steam absorber; Air coolers; Water saving

### 1. INTRODUCTION

Currently, about 80% of the world's total electricity produced is generated from fossil fuels, while the remaining 20% is obtained from different sources such as nuclear energy, renewable energy, etc. [1].

Because the non-renewable primary energy sources available are not unlimited, it is essential to increase the conversion efficiency as much as possible to optimally exploit the available sources. In order to improve the efficiency of the conversion processes used, numerous improvement techniques are being studied.

One of the most widely used technologies worldwide in the production of electrical energy are steam cycles, including the Rankine cycle, which transform heat into electricity. The main advantage of this cycle is its continuous development which gives it an industrial

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