

DIRECT-USES OF GEOTHERMAL ENERGY

A Case Study for Geothermal Development Company (GDC)- Kenya

Prepared and presented

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1.0 INTRODUCTION

- Applications of Direct-Use technology in Kenya is at infancy, but it is core to GDC's mandate and to the country's development.

Past and present

- Kenya is home to the world's largest geothermal-heated greenhouses at the Oserian Development Company Limited.
- Other Direct-Use investments/uses in Kenya are:
 - The Eburru pyrethrum dryer – set up in 1939
 - Lake Bogoria Spa hot pool – 2004?
 - Olkaria Spa – 2016?
 - GDC-Demonstration projects – 2015-2019
 - Community-based water harvesting at Eburru and Suswa

2.0 GDC DIRECT-USE JOURNEY

One of GDC mandate is to market and promote Direct-Uses of geothermal energy.

2.1 Researches and Studies

- GDC has carried out studies and researches internally and through partnership with development partners.
- Between 2012 and 2019, GDC in collaboration with USAID and later with ICEIDA, carried out various studies on Direct-Uses, mostly in most of the studies are in agro-processing
 - Geothermal Direct-Use guidebook - 2014
 - Greenhouse heating – Preliminary - 2014
 - Aquaculture heating – Preliminary - 2014
 - Milk processing – Comprehensive - 2014
 - Meat processing – Comprehensive - 2015
 - Drying of grains – Comprehensive – 2016

2.2 Outcome from the studies

- The 2012-2014 studies under collaboration with USAID recommended setting up of a demonstration center as “Direct-Use proof of concept” and a “Marketing tool” for the technology.
- The following demo projects were set up and have been used to market the technology.
 - Containerized Dairy Demonstration Unit – 150-litres batch pasteurizer
 - Two (5m by 5m) aquaculture ponds inside a greenhouse
 - A heated crop greenhouse (8x24m)
 - Clothes laundry and dryer units
- Later, in 2016-2019, a study on geothermal grain drying, funded by ICEIDA resulted in establishment of:
 - A geothermal powered semi-commercial grain dryer commissioned in Nov 2019

2.3 Demonstration Projects

i. Geothermal Heated Greenhouses

- Aim is to control humidity inside the greenhouse, hence minimise fungal infection and the const of controlling the infection.
- Provide relatively constant temperature for optimum growth.



ii. Heated Aquaculture ponds

- Heated by mixing geothermally heated water with cold fresh water to achieve a temperature of about 29°C, the optimum temperature for tilapia growth
- By keeping the pond at 29°C, tilapia maturity period is reduced to 6 months from 9 months in unheated ponds plus better quality of fish.



iii Geothermal-powered milk pasteurizer

- The 150 litre batch milk pasteurizer in Menengai uses geothermally heated water at 75°C to pasteurize the milk.
- Thermal energy cost savings for pasteurization can be reduced by about 60% by using geothermal energy compared to IDO



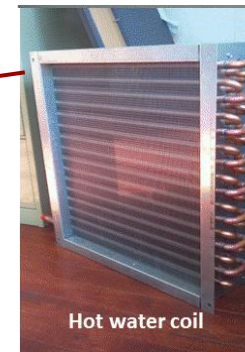
GDC pasteurizes milk using geothermal heat
Oct 12, 2021

iv Geothermal-powered laundry and dryer unit

The washer and dryer use geothermally heated water for washing and drying clothes

The dryer electric coil was replaced with a water heater coil hence

Water heating and drying costs have been reduced by about 40% compared with the use of electric heating and drying



iv Geothermal grain Dryer

- A 6-tonne batch dryer, powered by geothermal energy which has wet and dry storage bins
- The dryer uses geothermally heated fresh water to generate hot air between 45- 55°C.
- The energy usage is 60% of the same type using fossil fuels and electricity.



3.0 COMMERCIALIZATION OF DIRECT-USE PROJECTS - GDC's STRATEGY

GDC has undertaken considerable steps in the journey towards commercialization of Direct-Use technology.

- Operation of five (5) geothermal powered demonstration projects – 2015 to date to collect.
- Marketing of Direct-Use technology through operation of demo projects. Over 3,000 person, groups and institutions reached
- A detailed pre-feasibility study on Establishment of Menengai geothermal-powered Resource Parks - 2020
- Partnership with World Bank in undertaking Direct-Use concept of viability - Market sounding 2021
- Partnership with investors – GDC advertisement for EOI for setting up DU projects in Menengai Geothermal Field, Kenya – 2021
 - *Companies submitted EOI and later RFP. The RFP is currently being evaluated*

4.0 PROPOSED GEOTHERMAL POWERED RESOURCE PARK

GDC proposes to set up a Resource-Park in Menengai geothermal field to utilise the abundant geothermal resources already proven by drilling

The following are the Menengai Resource-Park enabler:

Geothermal energy – GDC has drilled over 50 wells in Menengai and realised steam and brine some of which have been earmarked for Direct-uses

Land - GDC has leased more than 3,000 in Menengai acres from KWS. Some of this land will be leased out to investors

Water - GDC has drilled water borehole for use during drilling, part of this water is available for use by the investors

Roads - Menengai is served by a network of roads providing access to Menengai.

Menengai Resource-Park enablers...cont'd

Raw materials - Nakuru is endowed with agriculture and other natural resources and therefore raw materials for most industries is available.

Labour: Nakuru has a large population with diverse expertise to utilise in the industries. Labour would be readily available

Market – The large population and the good communication network including the railway ensures raw materials, goods and services reach the required destination with ease

Technical expertise – GDC has a pool of geothermal experts to facilitate investment in geothermal Direct-Use powered projects.

5.0 DIRECT-USE COMMERCIALIZATION CHALLENGES

- Commercialization of Direct-Use technology is a capital-intensive venture; about USD 6 million is required for phase 1 for:
 - Energy supply infrastructure
 - Other infrastructure development to attract investment
- Being the pioneer for geothermal Direct-Use in Africa, GDC require support in the following areas:
 - Financial support from Development-Partners and financiers
 - Political support to enhance policy and investors facilitation
 - Capacity building and knowledge transfer

6.0 CONCLUSION

- GDC's Direct-Use journey has been very successful
- Researches, studies and the demonstration projects have all proved that Direct-Use technology is viable and profitable and beneficial to all stakeholders
- GDC's current focus is commercialization of the technology Direct-Use technology in partnership with investors and other stakeholders
- Support from Development partners, Financiers and government is very key to the success of Direct-Use powered investments
- GDC appreciates USAID, ICEIDA and WorldBank for the critical support in its Direct-Use Journey
- Financial and technical support from GRMF will be highly appreciated
 - Commercialization of the “Menengai Geothermal-Powered Grain Dryer”
 - Honey processing project – In Baringo-Silali Project
 - Full feasibility study of the “Menengai geothermal powered Resource-Park”

THANK YOU

