SolarChill – Monitoring data analysis tool

Introduction

As part of the Global Environment Facility (GEF) project **SolarChill**, performance data of solar direct drive (SDD) appliances from different manufacturers in three countries are measured. The objective is to clarify whether the vaccine refrigerators meet the WHO requirements in the field when installed in a health clinic (and not only during laboratory testing) and to identify the potential of unused excess energy.

The project uses three different Global System for Mobile (GSM) based measurements to monitor the refrigerator performance. Besides different monitoring characteristics, the systems slightly vary in terms of data size, structure and type. The monitoring systems are described in monitoring report #1.

Within the project, 113 SDD refrigerators were instrumented and the monitoring data from all devices resulted in more than one year of almost continuous data for 59 of the devices, while the other ones were disconnected or failed for various reasons during the project period. The project involved five different commercial types of vaccine refrigerators.

In order to facilitate the evaluation of the collected field data, a monitoring tool was developed to ease the otherwise time-consuming processing of the data.

Software tool

The basis is a software tool written in the programming language *Python*, which can process measurement data from various types of data loggers (HOBO, Nexleaf, BMedical). The program enables the processing and comprehensive analysis of different data types and formats.

Based on the measured variables the program allows conclusions about important characteristics and key performance indicators. Measured data includes:

- Internal temperatures
- Ambient temperature
- Voltage, current, power consumption, solar irradiation (For HOBO data loggers only)

As one of the main outputs, the analysis of the internal temperature provides information on whether the conditions for the safe storage of vaccines are met. Under additional consideration of the surrounding temperature, the devices can be compared under different climatic conditions. Measurements of the power consumption provide information on the compressor behaviour and, in conjunction with data on solar radiation, it can also be analysed whether the electricity generated by the solar panels can fulfil other tasks besides vaccine cooling.

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The evaluation process of the program includes calculations and associated graphical visualizations. The focus is on providing information on compliance with WHO requirements. The comparison of different types of cooling units is possible as well.

The additionally created user interface (Figure 1) clearly displays the different functions of the program and can be operated intuitively. Besides a short user manual, it offers help buttons explaining the functions of the individual elements in more detail. Therefore, previous knowledge of the programming language Python is not necessarily required to run the tool.

In summary, the monitoring tool contributes significantly to the data preparation and analysis regarding behaviour of the SDD cooling units in the field. By integrating several measurement systems, models from different manufacturers can be compared easily and fast. The monitoring tool is particularly useful for obtaining a quick overview of long data series and for identifying erroneous data before the final analysis and comparison of results.

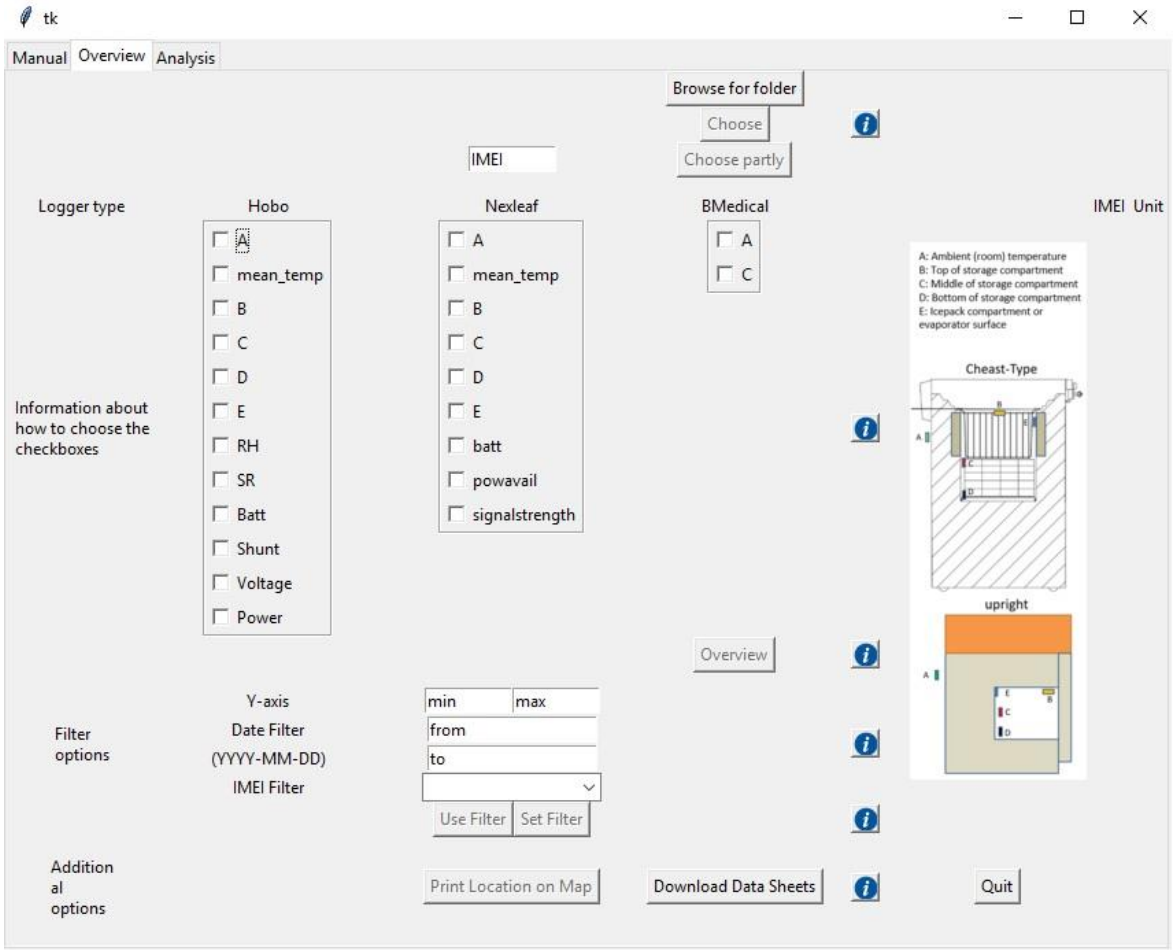

Figure 1: User Interface of the monitoring