Development of Tools for Efficient Remote Monitoring of Faecal Sludge Treatment Units

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BIOMASS CONTROLS

AfricaSan5 FSM5

Smart Faecal Sludge Treatment

Data and the cloud

- It's all about data
- Data generated by a treatment technology for faecal sludge
- Data, managed, analysed and communicated, using the internet

Smart Faecal Sludge Treatment

Objectives

- Enable automated remote performance monitoring
- Indicate compliance with forthcoming international standard ISO/PC 318
- Provide reproducible results for local, national and global monitoring purposes (SDG 6.2.1 and 6.3.1)

Data Generation

Biogenic Refinery - thermal treatment of faecal sludge

- **Input:** max. 35% moisture
- **Process:** pyrolysis
- **Outputs:** biochar, heat, electricity
- **Operation:** decentralised
- **Location:** from Alaska to India


GROSS
WEIGHT
14,300


ASHOK LEYLAND

Data Collection

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Sensors

- Temperatures (air and water)
- Oxygen levels
- Flow rates
- Power usage

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Database and kelv°n

- MySQL relational cloud database
- Real-time data access
- Web and mobile app, kelv°n: **https://kelvinapp.io/**

Data Processing

Open source data science tools

- Who is familiar with the R software environment?
- Who uses R on a regular basis?
- Who is interested in using R more regularly?

Data Processing

Open source data science tools

- R
- R Studio IDE
- R Markdown
- Shiny
- Digital Ocean
- Git
- GitHub

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Data Analysis

Key Performance Indicators (KPIs)

10 KPIs THAT INDICATE

- Emission control
- Combustion efficiency
- Thermal efficiency
- Process reliability
- Electricity consumption
- Electricity generation

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SCORING

- Calculate every "run" of the refinery
- Score each KPI between 0 and 10
- Standard compliance at KPI score 5
- Maximum (total) score is 100

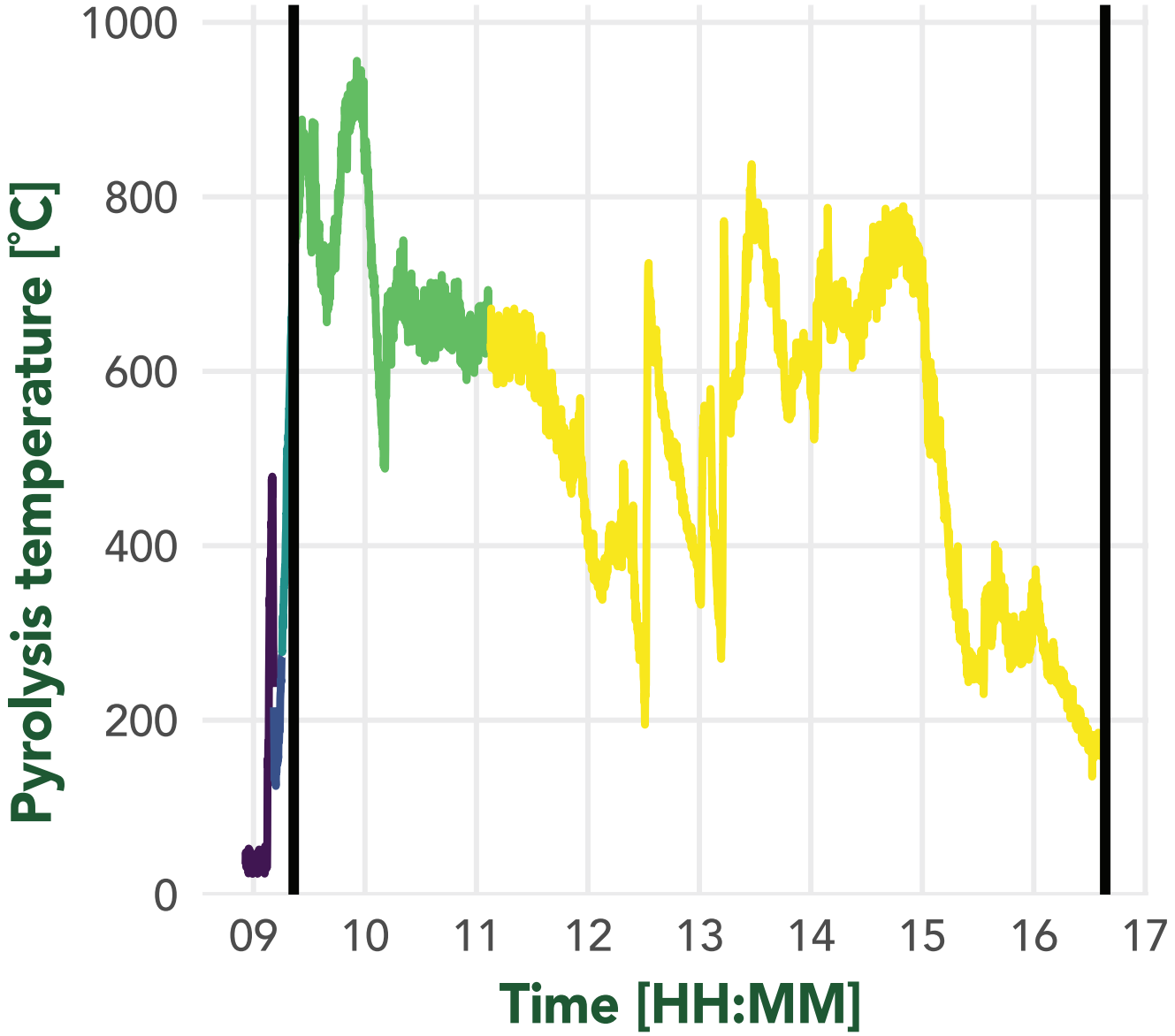
KPI 8: Time in steady-state operation

- **Description:** Measures the total time that the system is in "run" state.
- **Purpose:** Reliability indicator; failure flag
- **Data need:** `TIME` and `STATUS`
- **Calculation:** Calculate the time interval between beginning of `RUN_STATE` and end of `RUN_STATE`

Data Analysis

‘Operational State’

- STAND_BY
- START_UP
- BOOST
- RUN_DRY
- RUN_WET



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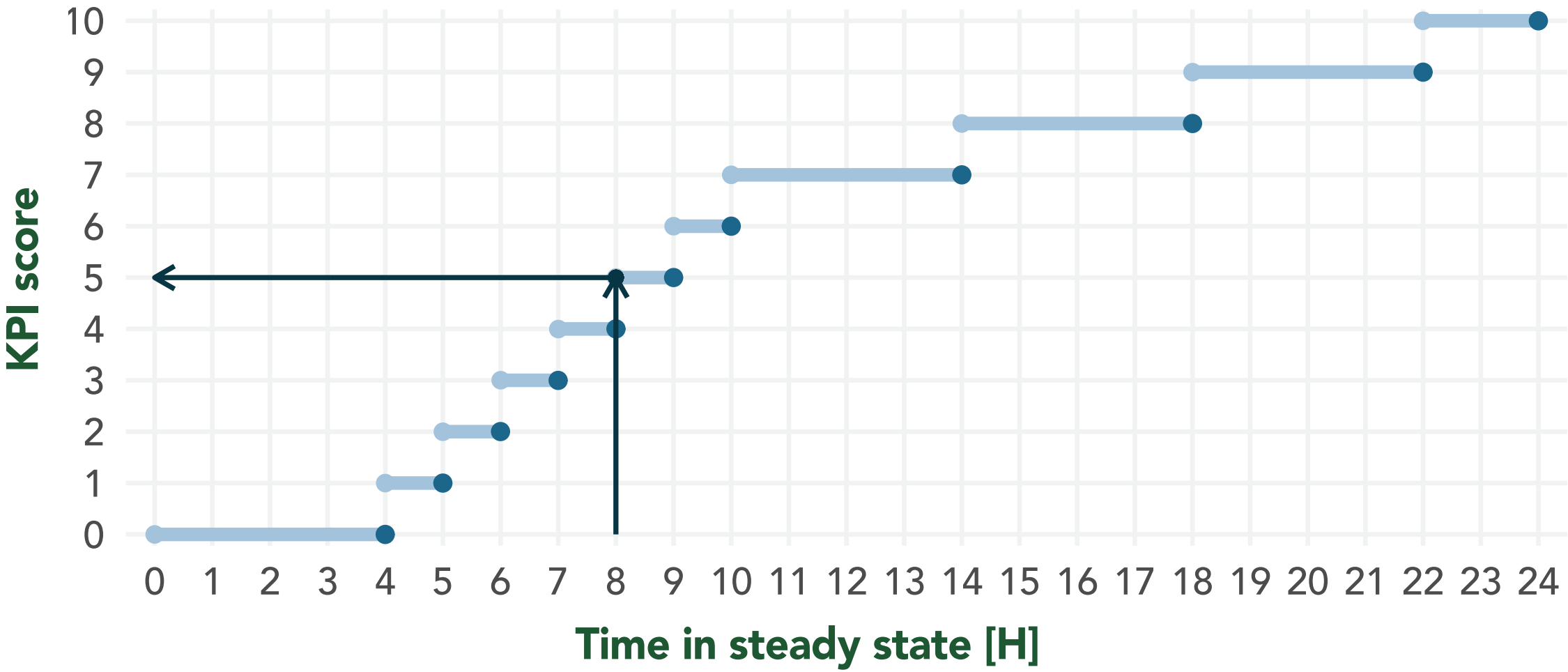

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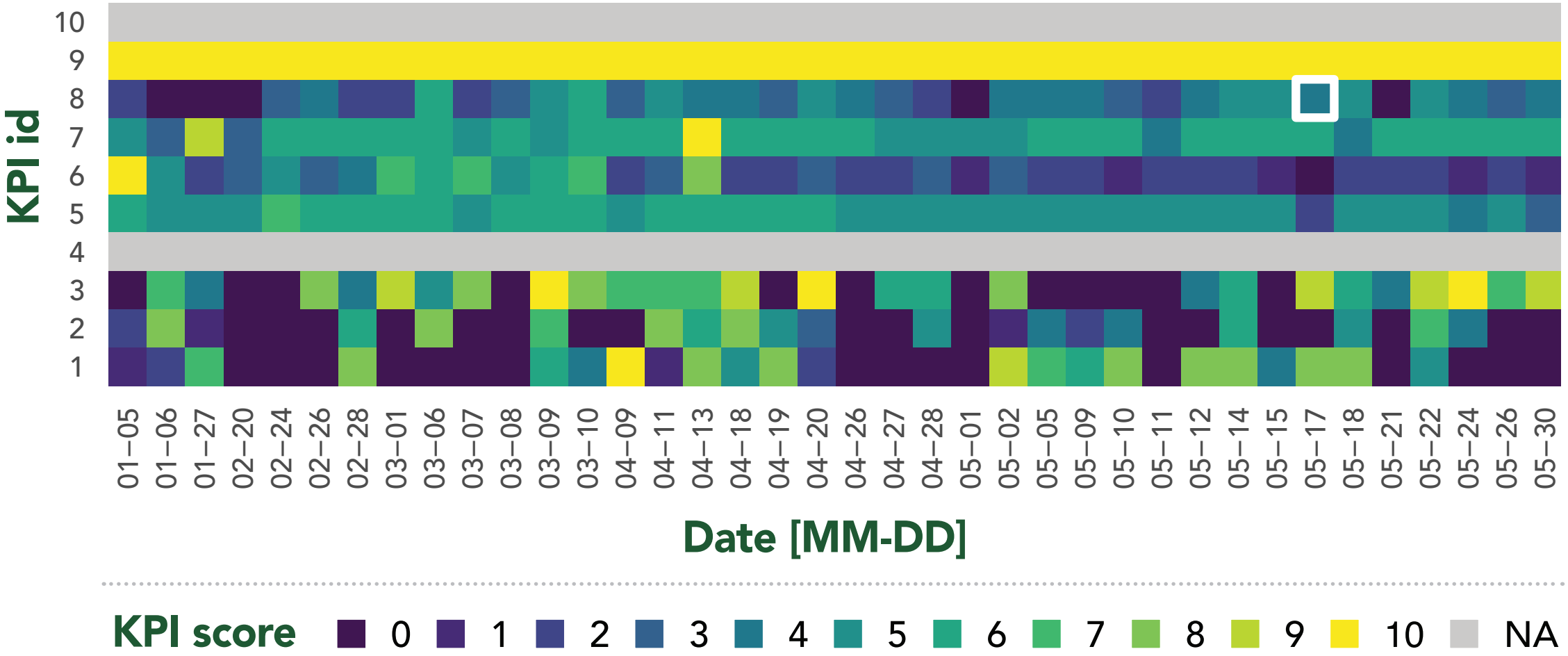

Take-aways

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- Data for ISO compliance and SDG monitoring
- Tools are scaleable and developed in open source environment
- Efforts to increase data leadership skills are required
- Internet of Things applications offer great potential for FSM service delivery

CHALLENGE:

Development of a global faecal sludge data repository

Thank you!

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