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VFD Installation for Tea Withering Process

Nationally Appropriate Mitigation Actions in the Energy Generation and End-user Sectors in Sri Lanka

01, February 2019

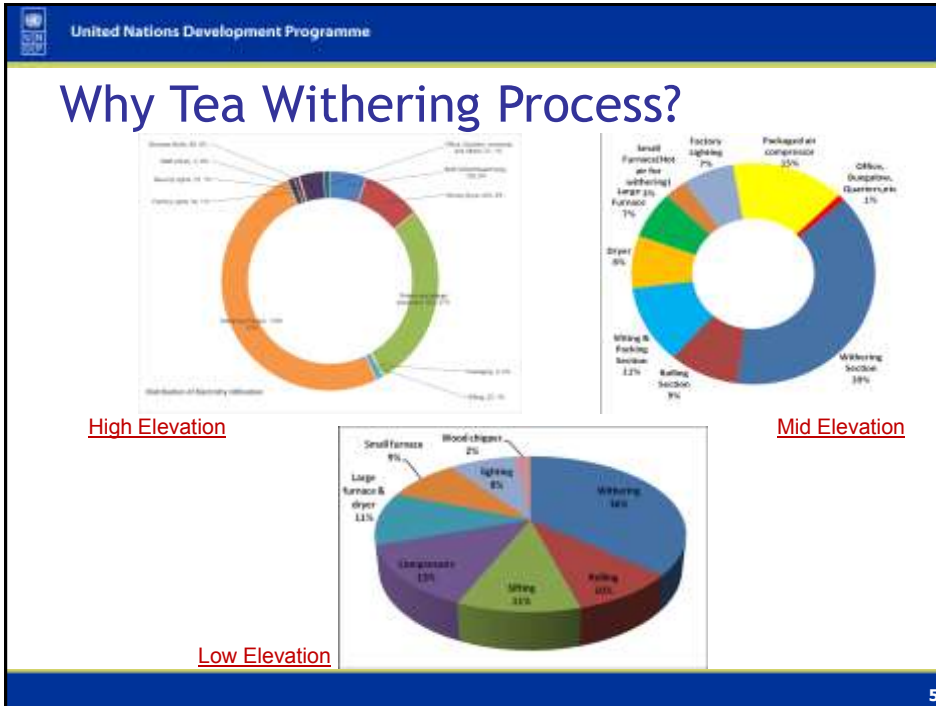





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Project Overview

- ❑ Objective: To develop a robust, transparent and functional NAMA framework along with clear inventory and MRV and system
- ❑ Implementing Partners: Sri Lanka Sustainable Energy Authority & Climate Change Secretariat-Sri Lanka in collaboration with UNDP, Sri Lanka
- ❑ Executive Partner: Ministry of Power & Renewable Energy
- ❑ Project Duration: June 2015 – June 2019
- ❑ Budget: 1.79mn USD
- ❑ Funded by: Global Environment Facility (GEF)

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What is the Technology?

❑ Variable Frequency Drives




Expectations from VFD pilot

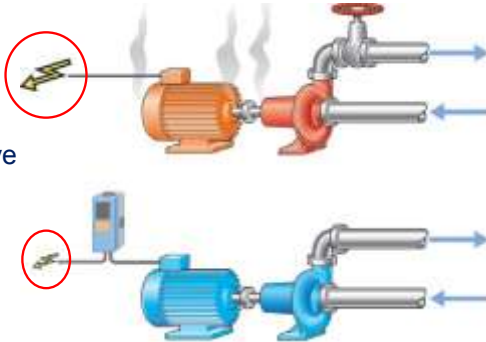
- Install 1,000 Variable Frequency Drives
- Save 21,500 MWh in 05 year
- Mitigate 16,326 tCO₂

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Variable Frequency Drive

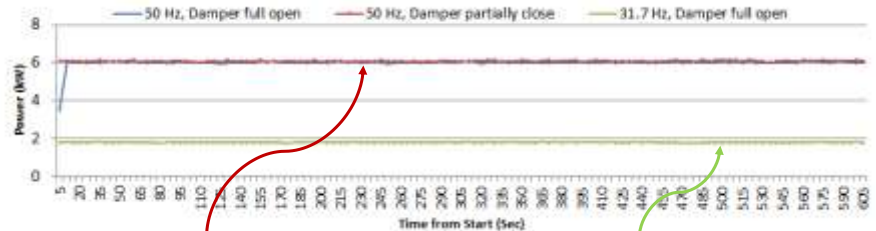
- ❑ VFD is a type of Electronic motor controller that drives and varies the speed of an electric motor by varying the frequency and voltage supplied to the motor
- ❑ Other Names for VFDs
 - ❑ Adjustable Frequency Drive
 - ❑ Inverter
 - ❑ Variable Speed Drive




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VFD for Tea Withering



| Time (Sec) | 50 Hz, Damper full open (kW) | 50 Hz, Damper partially close (kW) | 31.7 Hz, Damper full open (kW) |
|------------|------------------------------|------------------------------------|--------------------------------|
| 5 | 0 | 0 | 0 |
| 10 | 6.0 | 4.0 | 0.5 |
| 20 | 6.0 | 4.0 | 0.5 |
| 100 | 6.0 | 4.0 | 0.5 |
| 200 | 6.0 | 4.0 | 0.5 |
| 300 | 6.0 | 4.0 | 0.5 |
| 400 | 6.0 | 4.0 | 0.5 |
| 500 | 6.0 | 4.0 | 0.5 |
| 600 | 6.0 | 4.0 | 0.5 |



Motor: @ **full** speed
Damper: **partially** closed



Motor: @ **reduced** speed
Damper: **fully** opened

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VFD for Tea Withering

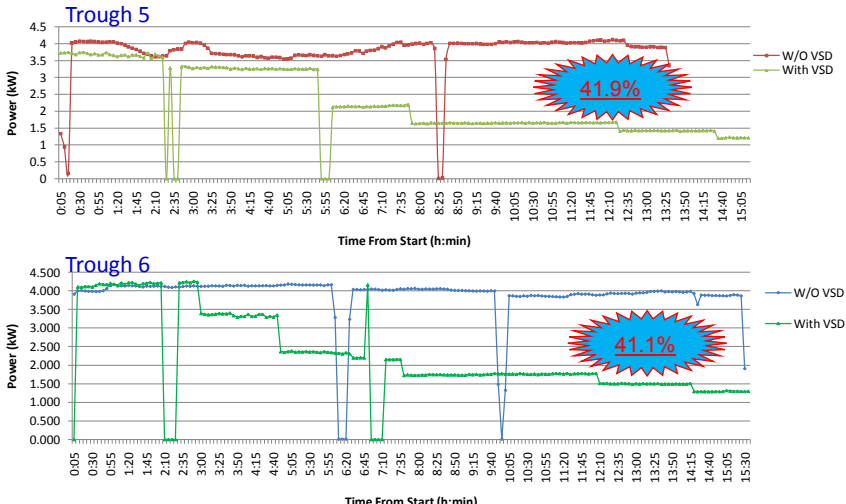


**NO
ENERGY
SAVING !!!!**

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Project Approach



Trough 5

Power (kW)

Time From Start (h:min)

W/O VSD

With VSD

41.9%

Trough 6

Power (kW)

Time From Start (h:min)

W/O VSD

With VSD

41.1%

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Present Status

| | 1 st Cycle | 2 nd Cycle |
|-------------------------------|-----------------------|-----------------------|
| No. of Application received | 95 | 42 |
| No. of VFDs approved | 732 | 332 |
| Total grant approved (mn LKR) | 34.7 | 13.4 |
| No. of Factories confirmed | 44 | 19 |
| No. of VFDs installed | 315 | 161 |
| Total grant disburse (mn LKR) | 15.3 | 6.16 |

- ❑ Project will Termination: **June 2019**
- ❑ Final date for submission of invoices: **15 April 2019**

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MRVed Energy Savings

Total Energy Saved – 315 VFDs, 7 months: 800 MWh

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Other Advantages of VFDs

- Precise controllability & flexibility on withering
- Product quality improvement
- Protection to the motor
- Soft-starting for the motor
- 'Peak energy cost' saving
- Remote monitoring facility can be enabled
- Decreased mechanical stress reduces maintenance cost and down time, extended equipment life
- Sub metering facility for energy consumption
- Recording facility of operation time
- Can be used to automate the process

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Energy Savings Calculation & Monitoring

| | |
|---|--|
| GHG Emission Reduction = Energy Saving x GEF | <u>Example</u> |
| Energy Saving = Baseline kWh – Project kWh | kW _{@50Hz} – 6.83 kW (7.5 kW motor) |
| Baseline Consumption = [kW _{@50Hz} x (H ₂ - H ₁)] | H ₁ – 1781 |
| Project Consumption = [(kWh ₂ - kWh ₁)/0.97] | H ₂ – 2049 |
| | kWh ₁ – 8749.3 |
| | kWh ₂ – 9898.6 |
| GEF – Grid Emission Factor | Baseline Consumption = 6.83 x 268 kWh |
| kW _{@50Hz} – Motor power consumption at rated rpm | Project Consumption = 1149.3 kWh |
| H ₁ – Previous month motor running hours | Energy Saving = 681.1 kWh |
| H ₂ – Current month motor running hours | Percentage Saving = 37.2 % |
| kWh ₁ – Previous kWh meter reading | |
| kWh ₂ – current kWh meter reading | |
| Monitoring Parameters | |
| <input type="checkbox"/> Hour meter reading | |
| <input type="checkbox"/> kWh meter reading | |

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How we address major Concerns?

Surge Protection Devices (SPDs)

Harmonics

IP class

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Other Steps towards Sustainability

- Registered reputed suppliers and their products
- Product warranty
- Training of operation and maintenance
- ICT facility for savings monitoring
- Training to MRV of savings

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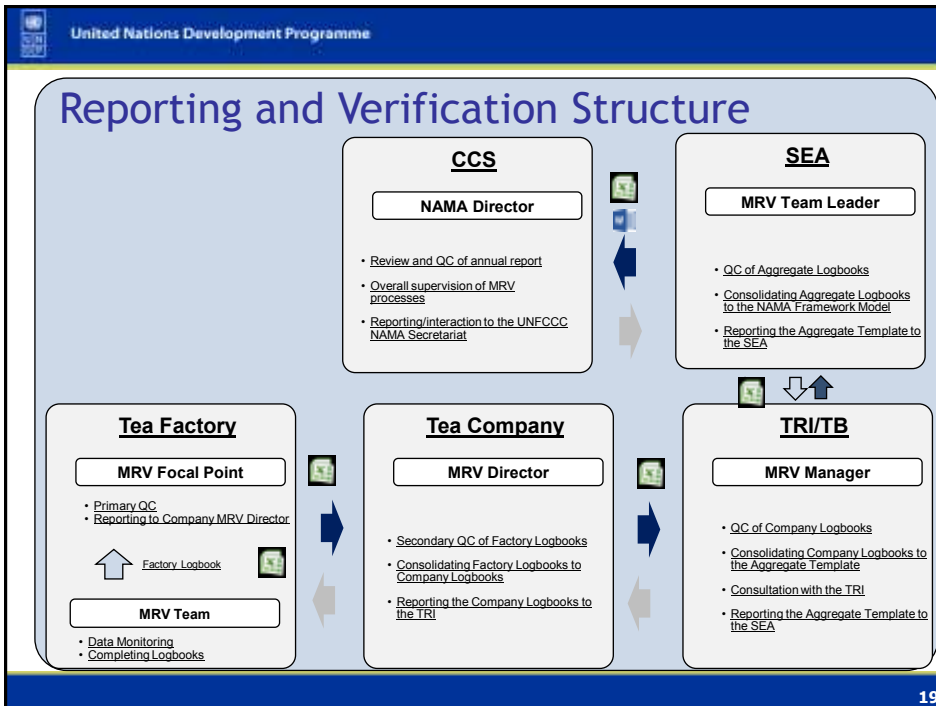
Factors to Be Considered in Using VFDs


- ❑ Do not compromise on quality of withering
- ❑ Train and motivate staff to control through VFDs



I'm not a magician.
Use me!! Control me to achieve maximum saving

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Discussion

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