

3.3 Project Idea for Technology 2: Variable Speed Drives for Motors (VSD)

Project Idea:

'In country capacity development through strengthening of institutions / organizations for reducing carbon emissions in industry through switching to modern green drive'

3.3.1 Introduction and Background

Constant speed motor drives are associated with various losses due to its inability to adjust the speed to suit the application. It is possible to save energy as much as 60% depending on the application using speed control. High savings can be achieved with fans and pumps that are very common in most of the industries. The traditional speed controls use mechanical speed reduction methods such as gearwheels and belt with pulleys. Both these methods have high energy losses due to friction. Moreover, motor running at a higher speed contributes additional losses such as frictional and iron losses. Further, such speed control systems are bulky or needs considerable space with the need of frequent maintenance depending on the usage and environment.

The variable speed control system or an electronic drive can adjust the speed to suit the application not only by adjusting the speed but also torque characteristics of the motor. Since the speed controller is electronic, the energy loss in the controller is very much less than that of a mechanical speed controller and also very compact. However, electronic drives should have stable supply for its trouble-free operation. Various manufacturers provide other technologies to achieve fine improvements of motor operation to achieve more energy saving and optimizing the operation.

Motor driven pumps and fans controlled by variable speed drives, as described above, can achieve high energy savings according to the theory. The basic law of fluid flow shows that the power requirement is proportional to the cube of the flow speed. If the speed is reduced by 80% (this does not affect most of the process unless high precision of speed is required) the energy requirement can be reduced by 51%. This is a typical application in withering process in tea manufacturing. Most of the pumping applications

can also achieve this type of saving if the speed is reduced, as it cannot be a problem as pumps generally operate only intermittently – runs at full speed and then idle. However, since average electronic drives generally produce non-sinusoidal current waveform, it is preferable to use motors recommended for such application for better life span.

Investment cost of variable speed drive technology is about 104,563 US\$/tCO₂ reduction. Expected electricity (economic benefit) saving is about 151,109MWh per year. Expected greenhouse gas reduction is about 51,679 tCO₂e per year.

3.3.2 Objectives

- Increase the amount of VSD use in local industry and service sector applications.
- Strengthen institutions to facilitate to industries and service organizations to use VSD, EEM and mitigation technologies to reduce their GHG emissions and cost of production/service.
- Develop in house capacity for industry service providers to promote, implement and maintain mitigation technologies such as EEM, VSD.

3.3.3 Outputs of the Proposed Project

- Strengthened, enforced and expanded ESCOs and regulatory agencies. Expected output is to strengthen SLSEA and CEA officers and 30 ESCOs.
- Strengthened public private partnerships, joint ventures among ESCOs, universities, government institutes and private organizations. Expected output is to develop ten partnerships.
- Technical and financial facilitation for upgrading in-house capacity of institutions. Expected output is to enhance in house capacity of ESCOs.

3.3.4 Relationship to the Country's Sustainable Development Priorities

According to the Countries National Development Plan, Mahinda Chinthana (Vision for the Future) the strategy of the government ensures that by 2020, Sri Lanka's industrial sector will be a highly value added, knowledge-based, internationally competitive and diversified sector which employs a highly paid, skilled workforce. The sector is expected to mobilize more local raw material and have a large value creation particularly for a growing economy. The government is also promoting environmental sustainability and green technology in industrial activities.

Improve the energy efficiency and increase the renewable energy usage have been identified and given priority in National Action plan for *Haritha* (green) Lanka programme. Actions under the Mission 1 (clean air-everywhere), Mission 3 (meeting the challenges of climate change) and Mission 9 (greening the industries) are developed for climate change mitigation and reduce the environmental pollution.

In addition, National Cleaner Production policy and sectoral policies have been developed to improve resource efficiency of the industrial and service sectors.

3.3.5 Project Deliverables

- Results of capacities and in-house facilities of all ESCOs and service providers in the country
- Identified inadequacies and shortcomings of existing ESCOs and service providers
Registry of all suppliers of electrical drives with their technical capacities
- Capacity development training package for ESCOs and service providers

3.3.6 Project Scope and Possible Implementation

The word VSD covers all Variable Speed Drives, Variable Frequency Drives and Variablen Volume Drives which are us in HVAC & R (Heating ventilation Air Conditioning and Refrigeration) systems, pumps and general industries such as tea industry. These industries are currently using standard electric drives wasting high amount of energy and leading to CO₂ emissions. With the development of tourism, anticipated 40,000 rooms in 2016, the use of this machinery become threefold. Therefore the scope of using these modern drives is very high.

The implementation of the project is made feasible through the new energy management regulations enacted under SLSEA portfolio (put regulation #). Under this regulation all electrical energy users consuming more than 50,000kWh have to report monthly about their consumption and steps taken to improve energy efficiency. This companies will be ready to implement low cost technologies to bring down the energy consumption in their enterprises.

3.3.7 Project Activities

Project activities are as follows for the Variable Speed Drives technology.

1. Survey of all ESCOs, service providers to identify their capacities, in-house facilities
2. Conduct a need/gap analysis to identify the inadequacies and the shortcomings
3. Develop training programme for capacity development of selected ESCOs and service providers
4. Develop a registration mechanism for all the suppliers of electrical drives with their technical capacities
5. Select ten companies for installing VSD/ VFD demonstration units and assess the requirement including specifications for equipments.
6. Conduct a survey on in-house facilitation available with the ESCOs, suppliers and service providers
7. Prepare specification for a standard toolkit set and fixture requirements for upgrading facilities at ESCOs
8. Obtain quotations for demonstrations VSD/VFD units and toolkits
9. Submit funds requirements for ten demonstration VSD/VFD units 25 toolkits to UNFCCC climate technology centre and network and green climate fund
10. Conduct one training programme to test the effectiveness of the capacity building training package
11. Install demonstration VSD/VFD units at selected companies using trained ESCOs
12. Prepare a report on institutional building of ESCOs, service providers, suppliers for further funding

3.3.8 Timelines for the Proposed Activities

Table 3.5: Timelines for Proposed Activities of Project 2

Activity	Time Frame	Duration	Output
1. Survey of all ESCOs, service providers to identify their capacities, in-house facilities	Month 1 to Month 8	8 months	Identified ESCOs and their capacity
2. Conduct a need/gap analysis to identify the inadequacies and the shortcomings	Month 9 to Month 12	4 months	Identified GAPs
3. Develop training programme for capacity development of selected ESCOs and service providers	Month 13 to Month 18	6 months	Developed training programmes
4. Develop a registration mechanism for all the suppliers of electrical drives with their technical capacities	Month 16 to Month 18	3 months	Developed registration mechanism
5. Select ten companies for installing VSD/ VFD demonstration units and assess the requirement including specifications for equipments.	Month 16 to Month 18	3 months	Ten companies selected to install demo units
6. Conduct a survey on in-house facilitation available with the ESCOs, suppliers and service providers	Month 16 to Month 19	4 months	Identified available in house capacity
7. Prepare specification for a standard toolkit set and fixture requirements for upgrading facilities at ESCOs	Month 20 to Month 21	4 months	Std. toolkit list ready
8. Obtain quotations for demonstrations VSD/VFD units and toolkits	Month 22 to Month 23	2 months	Price quotations received
9. Submit funds requirements for ten demonstration VSD/VFD units 25 toolkits to UNFCCC climate technology centre and network and green climate fund	Month 24	1 month	Fund proposal submitted
10. Conduct one training programme to test the effectiveness of the capacity building training package	Month 24 to Month 26	3 months	Tested training package
11. Install demonstration VSD/VFD units at	Month 27 to	8 months	Demo units installed

selected companies using trained ESCOs	month 34		
12.Prepare a report on institutional building of ESCOs, service providers, suppliers for further funding	Month 34 to Month 36	3 months	Completed report

Table 3.6: Timelines for Proposed Activities of Project 2

Activity	Year 1	Year 2	Year 3
1. Survey of all ESCOs, service providers to identify their capacities, in-house facilities	■		
2. Conduct a need/gap analysis to identify the inadequacies and the shortcomings		■	
3. Develop training programme for capacity development of selected ESCOs and service providers		■	
4. Develop a registration mechanism for all the suppliers of electrical drives with their technical capacities		■	
5. Select ten companies for installing VSD/ VFD demonstration units and assess the requirements		■	
6. Conduct a survey on in-house facilitation available with the ESCOs, suppliers and service providers		■	
7. Prepare specification for a standard toolkit set and fixture requirements for upgrading facilities at ESCOs		■	
8. Obtain quotations for demonstrations VSD/VFD units and toolkits		■	
9. Submit funds requirements for ten demonstration VSD/VFD units 25 toolkits to relevant authorities as indicated above		■	
10. Conduct one training programme to test the effectiveness of the capacity building training package			■
11. Install demonstration VSD/VFD units at selected companies using trained ESCOs			■
12. Prepare a report on institutional building of ESCOs, service providers, suppliers for further funding			■

3.3.9 Budget/Resource Requirement

Table 3.7: Budget Estimate for Proposed Activities of Project 2

Activity	Proposed Budget (US\$)
1. Survey of all ESCOs, service providers to identify their capacities, in-house facilities	50,000
2. Conduct a need/gap analysis to identify the inadequacies and the shortcomings	30,000
3. Develop training programme for capacity development of selected ESCOs and service providers	40,000
4. Develop a registration mechanism for all the suppliers of electrical drives with their technical capacities	10,000
5. Select ten companies for installing VSD/ VFD demonstration units and assess the requirement including specifications for equipments.	4,000
6. Conduct a survey on in-house facilitation available with the ESCOs, suppliers and service providers	18,000
7. Prepare specification for a standard toolkit set and fixture requirements for upgrading facilities at ESCOs	7,000
8. Obtain quotations for demonstrations VSD/VFD units and toolkits	4,000
9. Submit funds requirements for ten demonstration VSD/VFD units 25 toolkits to UNFCCC climate technology centre and network and green climate fund	2,000
10. Conduct one training programme to test the effectiveness of the capacity building training package	12,000
11. Install demonstration VSD/VFD units at selected companies using trained ESCOs	35000
12. Prepare a report on institutional building of ESCOs, service providers, suppliers for further funding	3,000
Total Cost	215,000

The project will be carried out over three (3) years.

Project Management cost is about 20% of the total cost (US\$ 43,000). Operation cost is about 80% of the total cost (US\$ 172,000). The funds necessary will be obtained through local and international sources

3.3.10 Measurement / Evaluation

Progress monitoring of this project would be done every quarter by a steering committee appointed by the Ministry of Power and Energy which is the executing agency of the proposed project. The steering committee will comprise Ministry of Power and Energy (Chair person) Sustainable Energy Authority, Ministry of Environment, Ministry of Industries, Treasury and Technical Service Providers. Progress monitoring would be done by the steering committee every quarter or once in six months.

The project evaluation would be done periodically by an independent expert group appointed by the Ministry of Power and Energy in consultation with the funding agency.

The measurement and evaluation will be started with high energy users registered with SLSEA where the enterprises are mandated to report energy consumption on regular basis. There are 1600 enterprises identified high energy users which are covered by 800 registered energy managers from the companies. This project will ensure a reduction in their energy bill and resultant drop in carbon emissions. Therefore it will be easy to evaluate the success of the project through a monthly records of the enterprises send to SLSEA. SLSEA mechanisms will be used to measure the reduction in energy consumption.

3.3.11 Possible Complications / Challenges

Possible Challenges are as follows.

- The need (total energy required by industries) might vary making the estimate inaccurate.
- The cost of technology on the global supplier can change leading to higher investment that what was estimated.

3.3.12 Responsibilities and Coordination

Project coordination and implementation will be done by the Sri Lanka Sustainable Energy Authority with the participation of Ministry of Environment, Sri Lanka Sustainable Energy Authority, Technical and Vocational Universities, industry chambers and professional associations.