

TECHNOLOGY FACTSHEET

ENERGY SAVING BY MEANS OF SPEED CONTROL OF MOTOR DRIVES¹

1. **Sector/ Sub Sector:** Methods of electrical energy reduction that are applicable to all industries using electrical drives (motors).
2. **Introduction:** Electrical energy is a clean energy available for many applications, but can have a high environmental impact due to low overall efficiency from primary energy source (if non-renewable) to the user end. By reducing the usage or making the usage efficient, environmental impact can be greatly reduced. The following account provides details of two such techniques.
3. **Technology Name:** Energy saving by means of speed control of motor drives.
4. **Technology Characteristics:** The solutions rely on energy saving by controlling the motor speed, thereby replacing inefficient mechanical speed controlling devices. The net results are application dependant. A general description of the technologies are given in Appendix-1.
5. **Country Specific Applicability:** Applicable universally, but the benefits depend on the industry type and plant type.
6. **Status of the technology in the country and its future market potential:** There are several ESCOs who can provide such solutions, but prefer established organizations in view of support.
7. **Barriers:** Initial expenses and technology know how that has to be applied to different types of industries.
8. **Benefits:** As a rule of thumb, reduction of one unit of electrical energy can save nearly twice the equivalent energy of primary energy. If non-renewable energy is used, such technologies can provide higher mitigation effects in energy usage applications compared to renewable energy generating and usage.
9. **Operations:** Variable speed drives are generally programmed to operate automatically. However, involvement of a trained technical personnel or supplier may require in case of a problem.

¹ This fact sheet has been extracted from TNA Report – Mitigation for Sri Lanka. You can access the complete report from the TNA project website <http://tech-action.org/>

10. Costs: Cost varies widely with the application from a few thousand to a few million rupees.

Appendix - 1

a. Variable Speed Drives

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 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 operates 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.