Why Energy Efficiency Improvement Projects Fail

Introduction

In many walks of life, particularly business life, "Success is everything". And so it is with Energy Efficiency-- success *is* everything! There are many incentives for undertaking an Energy Efficiency Improvement (EE) Programme, and companies promoting such programmes can obtain immense gains through the successful implementation of these projects. (What these benefits are, is the subject of another article "Why Promote Energy Efficiency?" that will soon be available on our web-site http://www.sudnya.com). But what is success?

The dictionary defines success as "a favourable termination". Conversely, failure is "a falling short; non-performance". Thus if we clearly define our measures of success, we might be able to identify how we may fall short of it, and therefore, fail. This knowledge can thus guide us in managing our projects in such a manner that we will succeed.

Definition of Success

Success in EE Projects has many dimensions: Financial, Technical, and Human Behavioural.

Financial Success

One of the major goals of undertaking an EE Project is to save money, its success could be defined in purely financial terms: a successful project is thus one which meets its financial goals, i.e. one which generates the Net Present Value (NPV) that it is expected to generate. However, implicit in this definition is the successful operation of the project over the period over which the NPV is estimated. For this to happen, the project should not be a "flash in the pan" i.e. perform well once, and then disappear. It must rather be a reliable performer year-after-year. This can happen only if we look at technical and human dimensions of our project, and how it addresses the needs of the organisation and its people.

Technical Success

A few projects might effect a reduction in energy costs through substituting expensive energy sources with less expensive ones (e.g. a fuel switch from expensive fuel oil to inexpensive agro-waste), or through a tariff advantage (e.g. conducting energy intensive operations at night when electricity is less expensive). Leaving aside such projects EE Projects must bring about a reduction in energy usage in the facility. To be able to do this our project must be able to operate more efficiently in our plant under a wide range of operating conditions

than the present method; and our new method must be sustainable over the project life.

Human Behavioural Success

Technical success and sustainability are important criteria, but these are heavily dependent upon how human beings who operate and maintain the system are willing to deal with it. In behavioural terms, a successful project is one which pleases the people associated with it and makes them proud of that association.

Causes of Failure

Having defined what is a favourable termination we are in a better position to see what can cause failure of our EE Project. In addition to the financial, technical and human causes of failure, our measure might fail because of poor project management. The many factors that threaten our project's success are listed below, with some suggestions for preventing failure on that count.

Technical Factors

Inadequate Technical Definition

This is one of the most frequent causes of failure. As mentioned earlier, our facilities are never static the operating conditions are always changing. Our measure must be able to handle all the varying conditions. If our measure cannot do this, it will not be able to brig about large enough savings to generate its desired NPV.

This is where a lot of hard work is demanded of a number of people. Good plant must be studied to identify the actual operating conditions under which our system would have to operate. If reliable records are not available (and often they are not!) we may have to patiently observe and record the operating conditions over sufficient time to determine the demands on our system. This might require the co-operation of many of the operating staff.

Inadequate Engineering

Having clearly defined the range of operating parameters for our measure, we must ensure that it is engineered correctly. Most problems have more than one solution, but there is usually one best or highly preferable solution for obtaining high energy efficiency – however, the preferred solution for safety might be different and for quality or throughput it might be yet another! Good engineering would demand a solution that meets the primary objectives of throughput, quality, safety and sustainable energy efficiency. I use the term "sustainable" because it is not enough for our measure to have a high efficiency when it is new, but it must deliver high efficiencies

throughout its life. Since quality begins with design, a good design is the bedrock on which a successful EE Project can be built.

Good design must not only cater to the actual operation of the measure but also it must facilitate maintenance, replacement, control, safety, and operator convenience. If any of these parameters is overlooked, the sustainability of savings would be jeopardised.

Lack of Knowledge

Very often our ego leads us to believe that "we can do it", or "it is easy". If you walk through the graveyard of failed projects with an expert, you will find many a headstone that reads "Was laid here by an overconfident engineer. Alas he knew not that he knew not!" or words to similar effect. This is not to say that a specialist is required for the simplest activities, but when project costs are high, or you discern that there may be complexities, do not hesitate to call in a specialist – his fee is small in relation to your project cost and this little insurance will pay itself many times over, over the life of the project.

Improper Specification

Inadequate technical definition, inadequate engineering and lack of knowledge result in improper specification of the duty conditions and the expected performance from the equipment.

A clear specification of the performance expected from the system is necessary for vendors to deliver equipment that meets the project objective. Any ambiguity at this stage leads to underperformance and sometimes to disputes with vendors, i.e. to a project failure. Therefore, ensure that the specification is complete and adequate. If necessary, consult an expert.

Human/ Behavioural Factors

The attitude of the personnel dealing with the measure will ultimately determine its success or failure. In the hurly-burly of day-to-day operations, it is easy to overlook the factors that could win their support. What might distance them from our project?

Not Obtaining User Concurrence

We do not like things imposed on us. Neither do other. When people are told to do something new, there is always a resistance. If the change is made without their "buy-in" the situation is worse. It is known that projects have failed because the concerned people did not accept the change voluntarily.

We should secure their concurrence. It would be even better if we can seek their ideas and build them into the design. It would be highly desirable if preliminary designs are discussed with all concerned persons.

Inadequate Training

If the operating and maintenance staff is not trained to handle the new system, we should be prepared to see it fail. Lack of training causes operators to fear working on the machines. Severe damage to machines and personnel could result from operation by an untrained (but intrepid) person who ventures where angels fear to tread.

The solution to this problem is to ensure that operators and maintenance staff are trained to use the new system. Training might be on-site or off-site; in a class room or on the shop floor; hands on or theoretical – all depending upon the situation. A most important aspect of the training is to teach them what to so if there is a problem. In the worst case, how to keep the process working even if the measure does not generate any savings – typically how to by-pass the system. This will earn you the goodwill of your production manager. When such an event occurs, you will realise that operator training was inadequate – or that the system has to be modified to meet the condition that caused it to be by-passed.

Inadequate Documentation

We have all been vexed with situations wherein we need simple information about a system or a piece of equipment that should have been documented was not. Days, weeks or even months may elapse during which period we may send many reminders to vendors and manufacturers before the necessary information is available. And what happens to our equipment of system in the meantime? It is idle, and costing us money directly in the form of interest and depreciation, and indirectly because it is not bring in the savings that it was supposed to be. This directly reduces the project NPV.

Poor Project Management

Good project management is vital for the success of EE Projects which are cross-functional and often interdisciplinary. There are volumes of case studies of poorly managed projects, and any book on Project Management would cite many cases of each cause of failure. Our purpose is not to recount those horror stories, but merely to draw attention to some major causes, which often lead to failure.

Inadequate Planning

Detailed and meticulous planning is necessary for the success of any project. In EE Projects this is doubly necessary, as they are retrofit projects, and any failure to plan adequately can result in implementation delays, which if they result in a loss of production. Lost production makes customers unhappy, and therefore turns the entire organisation and management against EE Projects. This must be avoided at all costs. Our advice is: do not assume anything; estimate if you cannot calculate, calculate if you cannot measure, and do not

give up measurement until you have exhausted every direct or indirect method of measurement. One actual reading is worth reams of calculations!

Production losses increase the indirect costs of the projects very sharply. Even without lost production, delays cause an increase in project costs and thereby reduce the NPV.

Inadequate Budgets

Our poor planning often results in budgets that are inadequate to meet their purpose. Which in turn, result in incomplete or unsuccessful projects. Factor in costs of training, travel to verify vendors' references, documentation, spares and stand-by equipment (if necessary).

Inadequate Leadership

As in all walks of life, leadership is essential in EE Projects too. These must be lead by a person who believes in Energy Efficiency and is vested with adequate authority to implement the project. Naturally, the characteristics of the project itself and the organisation would decide who is suitable for this position. It would be good if a Top Management sponsor is found for the project.

Poor Co-ordination

Good co-ordination between operations, maintenance, production and the project staff (including vendors and contractors) is necessary if the project is to be completed on time and within budget. Good planning, adequate budgets, leadership which inspires the team can be hindered by poor communication and the resulting lack of co-ordination. The project leader must ensure that all relevant matters, events and decisions are communicated in a timely manner to the concerned points of action. As mentioned earlier delays cause an increase in project costs and thereby reduce the NPV.

The Role of Finance

The role of the finance function in projects is well known. It goes beyond providing the funds when demanded by the project manager. The role of the Finance function is to create an environment in which Energy Efficiency projects are treated like any other project. Beyond this, the finance staff can and should play a major role in project appraisal and devising risk management schemes.

Since the acid test of an EE Project is whether or not it has generated the targeted NPV, the critical role of the Finance department is to provide this feedback to the Energy Efficiency Team. Many things could go wrong here.

Absence of a Capital Recovery Budget

Most organisations we are familiar with do not have a Capital Recovery Budget. How this works is the subject of another paper on this website. Briefly, it is a system that tracks Energy Cost Savings and relates them to the investments made in EE Projects. Since there is no visible income stream (say as with the sales of a new product, or sales through a new branch office) this requires the establishment of some simple, regular systems in the organisation. The absence of these systems keeps management in the dark about the benefits they could derive from Energy Efficiency Projects.

Absence of a M&V System

"What we cannot measure, we cannot manage" is a dictum made popular by Jack Welch of GE. And so it is with Energy Efficiency Projects. A typical EE Project might result in a ½ to 2% reduction in the energy cost of an organisation. Given the variations that occur in volumes of output, raw material quality, production rates, product mix, power and fuel availability, quality & rates, it is difficult to attribute or even see reductions in energy costs from the utility bills. In the absence of a good Measurement and Verification (M&V) system, an increase in energy costs because of an increase in (say) production volume might hide the reduction in energy usage that might have been achieved (say) in the office; or a reduction in energy costs (through reducing usage) in one plant may be overshadowed by inefficient use of energy in another part of the plant. The latter increase in usage, if it masks the former savings, should not lead management to conclude that the EE Project is a "dead" investment which does not bring in returns. A good M&V system could prevent management from falling into such a trap.

Allowing Performance to Deteriorate

The absence of a good M&V system leads to another NPV reducer, namely, deterioration in performance. If we do not keep track of our accounts, we would not be able to ensure that our business is performing well. Similarly, if we do not track the performance of our Energy Efficiency programme, we would not know if its performance has deteriorated. Unless we know that there is deterioration in performance, we may not even know what has caused it, and therefore, what corrective action to take. We would thus lose energy in a perfectly avoidable manner – it is akin to not depositing into our bank a cheque secured from a customer! A good M&V system therefore, helps to sustain the savings from the programme. We are aware of cases where good M&V systems lead to identifying opportunities that were not originally envisaged. These opportunities when harnessed resulted in even greater savings from the EE Project. (Another article discusses the characteristics of a good M&V System for tracking EE Projects).

The Role of Energy Service Companies (ESCos)

Companies such as ours, who provide comprehensive energy cost reduction programmes to their customers, who guarantee minimum performance standards, and who link their remuneration to the actual measured performance of their projects are known as Energy Services Companies or ESCos. We are well versed with all aspects of Energy Management discussed here and we can help you to reduce your energy usage substantially (as much as 25%).

To conceive, design, implement, operate and monitor an Energy Efficiency Programme requires diverse skills which you may not have readily available in your organisation, or persons with these skills may be engaged in functions which are critical to your business, and therefore, not available for running your Energy Efficiency Programme. We have the necessary skills and resources to augment your team for the duration of your Energy Efficiency Programme. Thus we add specialised and skilled resources to add value to your business during your Energy Efficiency Programme and cease to be a burden by withdrawing them once your investment is recouped.

Contact us to learn how we can be of help to you!