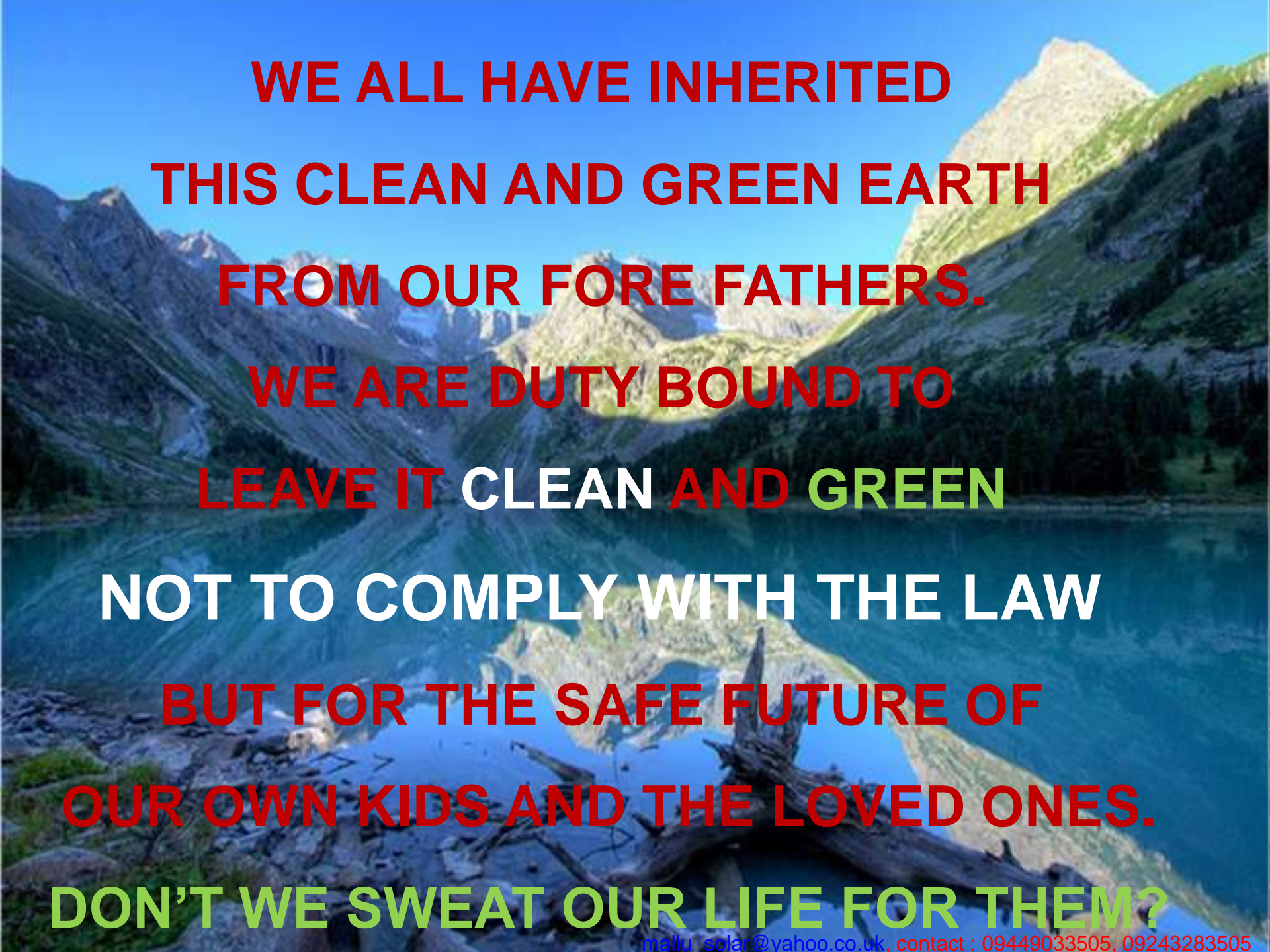


SUNSHUBH RENEWABLES & RESEARCH CENTER.



**WELCOMES THE DELEGATES
FOR THE HUMANITARIAN CAUSE TO KNOW WHAT IS ENERGY AUDIT?
AND SHOP FLOOR OPPORTUNITIES.**





**WE ALL HAVE INHERITED
THIS CLEAN AND GREEN EARTH
FROM OUR FORE FATHERS.
WE ARE DUTY BOUND TO
LEAVE IT CLEAN AND GREEN
NOT TO COMPLY WITH THE LAW
BUT FOR THE SAFE FUTURE OF
OUR OWN KIDS AND THE LOVED ONES.
DON'T WE SWEAT OUR LIFE FOR THEM?**

A scenic landscape featuring a calm lake in the foreground with three small wooden boats. The background is filled with lush green trees and rolling hills under a clear blue sky. The text is overlaid on this background.

We all consume energy in our day to day life, in our professional life - industries, offices, utilities etc.,

NOW DO WE NEED TO DEFINE ENERGY?

CERTAINLY NOT!!

But certainly the way to evaluate, the way we consume energy.

The process of 'energy use' evaluation is **ENERGY AUDIT**.

Energy is red, ENERGY AUDIT is not.

It is safe, it is user friendly, it is the cure for future accidents, it is the reliever at the time of hard & strain full work.

A photograph of a large, gnarled tree with a reflection in a pool of water. The tree's trunk and branches are dark and textured, and the water is calm, creating a clear mirror image of the tree above. The background shows a green lawn and more trees in the distance.

What are the types of energy audits?

We have walk in audit,
We have preliminary audit,
We have detailed audit.

What next?

We have post implementation
i.e., result confirmation audit.

A scenic landscape featuring a large, rugged mountain peak in the background, a river in the foreground, and lush green trees. The sky is filled with soft, white clouds. The text is overlaid on this background.

Energy audit is a way to avoid the possible accidents.

Energy audit is a means to avoid frequent breakdowns.

Energy audit is a means to increase productivity.

Energy audit is a means to reach back home safe and sound.

Energy audit is a way to increase the bond of friendship within the various departments.

Energy audit is a means to gain the confidence of the fellow workers, showing a great concern for their life safety.

Energy audit is a way to celebrate the results with our co-workers.

Energy audit is a step towards celebration times.

ENERGY AUDIT IS CERTAINLY NOT THE WAY AND/OR A TOOL TO PIN POINT MISTAKES OR FIND FAULTS WITH OUR CO-WORKERS.



The pointers of importance in energy audit are :

MANAGEMENTS REQUIREMENTS –

LEAST OR NIL INVESTMENT.

SUPERVISORS REQUIREMENTS –

TROBLE FREE OPERATION.

OPERATORS REQUIREMENTS –

**COMFORTABLE OPERATING
CONDITIONS.**

WHAT ARE THE POSSIBILITIES OF SAVING ENERGY IN IRON & STEEL INDUSTRIES.

The major operation in any steel industry is the thermal operations, followed by possible dressing operations.

In the foundry industry it is the melting and sand reclamation which consumes lot of fuel.

In the Rerolling industry it is the heating of ingots.

Not to forget the compressors and the air distribution systems.

In addition, the power stabilisation across any given point in the plant should be stable.

In the foundry industry -

It is the thermal energy use evaluation, ie, melting applications. While this is in progress the factors like carbon uptake, number of pouring etc will be key parameters in deciding the energy efficiency operations.

In addition, the preheating of the moulds where ever possible will also play a major role in specific energy achievements.

The next possibility is in the drier system for the mould drying region. Since this is low heat application area, the options are plenty based on the industry process.

If the unit has a sand reclamation plant, which also comes under the low grade thermal application, the potential to cut on heat source is high.

The other areas of energy conservation is in the electrical motors where the grinding applications are in process. The use of compressed air is crucial.

The machines are not supplied with study voltage, ie very low power factor operating conditions.

In the Re-rolling/Forging industry -

Heating the ingots as lower as possible will help save the energy.

The various passes that the bar under goes will be another area of energy efficiency.

Periodical check up on all electrical terminations will help avoid major breakdowns. This will be mainly due to the high operating temperatures.

The other areas of energy conservation is in the electrical motors driving the feed mechanisms.

The machines are not supplied with steady voltage, ie very low power factor operating conditions.

THE USE OF LPG FIRED GENERATORS WILL HELP IN REDUCING RECYCLING AND WASTE RECOVERY.

THE EXISTING DIESEL FIRED GENERATOR CAN BE CONVERTED TO LPG FIRED.

A stone arch bridge with multiple large arches spans a river in a mountain valley. The surrounding hills are covered in trees with autumn foliage in shades of orange, red, and brown. The sky is overcast and grey. The bridge is made of rough-hewn stone and appears to be in a rural or mountainous area.

Periodical maintenance in most of the cases doesn't exist at all.

The responsibility of the maintenance is considered to be the job of maintenance department,

The production departments roll in energy savings is not considered to be important, on the contrary it is the users who are responsible for energy saving and they should be present in all such workshops.

GENTLEMEN, YOU HAVE BEEN SEEING THE
BEAUTIFUL SCENERIES ALL ALONG THIS
PRESENTATION.

THEY EXIST AS OF NOW, THEY COULD **VANISH**,
IF OUR ENERGY CONSUMPTION GOES UNCHECKED.

THESE COULD BE POSTERS ON THE WALL.

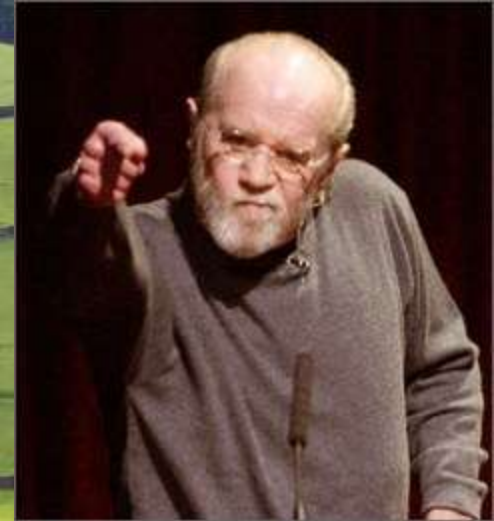
LET US NOT CREATE SUCH A SITUATION.
LET US NOT ALLOW THE GLOBAL WARMING TAKE
OVER OUR NATURAL BEUTY.



Let's pledge to leave behind clean and green earth. To do this, we need to initiate reduce our energy consumption.

And dear friends it starts with me, you. You are the initiators, you have the steering, you have the breaks and the accelerator too.

It is you and only you who can initiate the energy conservation practices to see our children hale, healthy and smiling. Lets leave the world the way it was gifted to our forefathers.





Thank you
&
See you again !!!

**in your shop floor,
working together to lookout for the
possibilities of energy conservation.**

**POWER FACTOR, ITS IMPACT ON
ENERGY SAVINGS
AND OTHER TANGIBLE BENEFITS.**

Mallikarjun A Kambalyal.

Certified Energy Auditor-EA 3485.

SUNSHUBH RENEWABLES & RESEARCH CENTRE,
31, Pagadi Street, Hubli-580020. Karnataka.

- **Significance :**

To evaluate and tabulate the findings of energy audit. It has been the responsibility of every electrical energy user to fix his PF nearer to unity.

In the interest of those who are non technical, please be known that the PF in electrical terms is very much similar to blood pressure of a human being.

Just as the deviation from the normal range is dangerous, so is the case of PF in the electrical system.

A low PF or a Very high (leading) PF will cause heavy loss; in case of the human system it is the life loss.

The fact that, the power consumed by industry sector, accounts for 50.7% against the 3.5% of agricultural sector has been neglected by and large but the fact is that the huge power loss exists in this sector is very much a fact. This is mainly due to the length of the transmission cable laid for the agricultural sector.

- **If the industry sector is by and large educated, the agricultural sector is largely uneducated. In both the cases we have the problem of power factor. The industry is not much concerned because the energy use pattern is unpredictable and or is advised by unskilled electrical contractors. The agriculturists are not to be blamed at all for the fact that they know not about Power Factor & its purpose, more important they get the power for free almost. Hence the point of concern is for those who wish to save on distribution loss either within or outside.**

The power factor parameter has been discussed widely by eminent technicians and every one has a point to support their views.

- Let me put my experience w.r.t., the power factor, on the energy conservation - saving drive.
- It has been widely discussed that the improvement in power factor does not reduce active power or the units consumed. *This statement is true at some point and false at the other.*
- Let us discuss with few case studies, below.

- **First**, all the technocrats know the power is combination of Active power, Reactive power and Apparent power. And the Power Factor is related to all the three powers in the system.
- **Secondly**, what is it that constitutes the system?
- Is it the device (motor, resistance heating coil or illuminating device etc.,) alone or is it in addition to the cable which interlinks the device and the power source, contactors, relays, measuring devices etc., and any other device which forms the part of the system as required on site.

- If you **consider the power** drawn by the device alone then the impact of power drawn by it, certainly is independent of power factor.
- **Is it just the device alone** that constitutes the system? Can this device work with out the other integral components? Certainly not, it is the cable conductor, contactors and all other devices that constitute the system which drives the key device.
- Hence the total power drawn should be the power drawn by the complete system. Every piece of the system constitutes to active power drawn.
- In this context **importance of the power factor is highly relevant** and should be a key parameter when the power loss is accounted for.

Let us consider a case.

				Prior to PF Correction																							
		Sl. No.		Cell details		Cable used Al in Sqmm		Resistance per KM		Time of Reading		KW		KVAR		KVA		PF		voltage		current		Voltage Harmonics		Current Harmonics	
		1		UJ		400		0.086		12:00		38.82		78.82		88.00		0.45		414.00		115.00		0.80		2.70	
		2		UJ		400		0.086		13:55		34.72*		57.00		69.00		0.50		415.00		97.20		0.70		4.30	
		3		UJ		400		0.086		14:40		37.20		66.80		77.00		0.48		418.00		106.70		1.60		5.80	
Average												36.91		67.54		78.00		0.48		415.67		106.30		1.03		4.27	

- The power factor improvement was taken up and the following readings were recorded.

Post PF Correction								
Time of Reading	KW	KVAr	KVA	PF	voltage	current	Voltage Harmonics	Current Harmonics
16:10	35.80	12.07	33.10	0.95	417.00	51.00	1.70	17.00
16:25	34.00	11.00	36.00	0.94	415.00	52.90	1.30	24.20
16:50	34.00	11.89	34.00	0.97	424.00	47.00	0.60	18.00
Average	34.60	11.65	34.37	0.95	418.67	50.30	1.20	19.73

- The pre & post power factor correction exercise showed that current in cable dropped substantially (as predicted), it was also found that the current harmonics increased five times.
- The current reduction was also associated with the KWs (active power) reduction. The fact that the same job work was operated, before and after correction, a 10% plus, reduction in active power was seen. This was mainly attributed to the system loss.
- As it is seen from the table 1 above the cable resistance and the current flow in the cable was measured to arrive at the cable & accessories loss.

Post PF Correction

Average Reading	KW	Resistance per KM	KVA	PF	voltage	current	I ² R loss	Other Losses
After correction	34.60	0.086	34.37	0.95	418.67	50.30	0.223	Assumed zero
Before correction	36.91		78.00	0.48	418.67	106.30	0.972	1.338

- The loss due to accessories is reflecting beyond acceptance. However it is the reading on site and has to be accepted the way it occurs.
- The point of discussion is just that the impact of Power Factor on the working system as a whole.
- Extending the discussion further to the total energy consumption scenario the total energy savings by virtue of power factor consideration alone works out to be 5% of the total energy consumed in the industry sector and .35% in agricultural sector. The fact that the agricultural sector is spread over vast area the actual energy loss is much more than 0.35%. If we can generalize the energy loss in the agricultural sector is nearer if not less than industry sector.

- **Inference:**

- It is to be considered by the large scale industries and the utilities and ascertain the actual loss rather than generalize the loss only on agricultural sector.

- **Conclusion:**

- It is now very prominent that the improvement in the power factor helps reduce power consumption both in terms of units and the contract demand
- The relation of power factor with active power drawn by the device should be extended to the system as whole and not the device alone.
- The current in the cable reduced inversely.
- The cable temperature was also less.
- The loss due to drop in temperature will further add to our benefits.
- The voltage level across the terminals improved marginally.
- The impact of surge loads is not felt by the smaller motors/machines.

- **The other tangible benefits are.**
- Under the given cable size available on the site, more machines can be loaded, which implies reduced infrastructure cost.
- The power consumption is reduced by around 10% which otherwise would have been lost as I²R losses.
- The other benefits of PF correction will also prevail over the entire industrial establishment.

- **PRECAUTION:**
- The point of concern or a critical factor is the RYB polarity that the industry has to follow. If the polarity is not followed then the result is that the PF would reduce and not increase in spite of any of the value connected in the network.

- The **sequencing of Capacitors** is equally important when the connections are being made. The centre lead should always be connected to the Yellow phase when RYB polarity is maintained within the industry.
- **EXTENSION:** the logic when extended to the utilities that are instrumental in power distribution will find that their losses can be substantially reduced. Considering the length of the distribution network the utility can achieve their distribution loss cutting in the first instance alone over 10%.
- **FURTHER STUDY:**
- The impact of current harmonics on the system has now to be carried out in depth and rectification measures implemented accordingly.

Thank You

Gentleman send your views or quarries to :

mallu_solar@yahoo.co.uk

Please let us know if you wish to read the articles published on:

1. S & L Parameters.
2. **WATER** its relation to **ENERGY**
3. **RAINWATER** its impact on **ENERGY CONSUMPTION** by municipal/civil bodies.