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General Intervention Plan (further detail)

This is a list of typical interventions that would be looked at when addressing a client's energy management strategy. Some are appropriate only in (for eg) industrial / manufacturing environments, or commercial spaces.
Most are just common sense, but are often neglected in the pursuit of a business result at the site.

All of the below topics are explained only in light and high level detail now. At the detailed level each could quite easily be the subject of an entire library of books.

M&V
We can only effectively manage what we measure.
To begin any programme of sustained efficiency without introducing some reliable means to measure the before and after scenarios is nonsensical. There are numerous methods and tools in this respect. Simbalism recommends and uses the PowerWatch™ system.

Tariff / Supply agreement analysis
There are usually a number of tariff options that a business can select from its power utility and the choice made can at times have a pretty significant effect on the price paid for energy. in addition, are you certain that you are being charged in accordance with your agreement with the utility? Time taken to analyse and manage this component of an energy programme can yield meaningful savings.

Energy efficient lighting
This relates to the technology of the light. In a commercial environment there is a considerable trend now to switching over to lighting technologies that consume less power per lumen delivered. The easiest example to look at here is the CFL globe available at all supermarkets allowing (for eg) a 15W globe to replace a 100W of older technology.

Energy efficient light sources
Within a given lighting requirement, a user typically has a number of options. For example in a warehouse or factory environment a customer may ponder the use of Low Pressure Sodium, High Pressure Sodium, Mercury Vapour, Fluorescent, etc, etc. Each of these options will present different characteristics, installation and operating costs – including power consumption and replacement cycles.

Time settings on plant & HVAC
Using HVAC as an example. Often considerable power wastage occurs through inefficient time settings that see chilling of a commercial building begin at (say) 6h00 each day, rather than 8h00 up until which time ambient temperature is still very comfortable. In a distressing number of cases HVAC and plant (computers included) run 24/7 (or at least 24/5)

Process change to incorporate equipment shutdowns
Again using HVAC as an example. If a building is flushed with fresh outside air at 5h00 this can alleviate the need for chillers to be switched on for a number of hours. Here a change in process can have a considerable power-saving result.

Power factor optimisation

PF is a highly specialised topic, but in extreme summary:
The sum total of power delivered by a utility is measured in KVA. However the way that this total supply is used by a client will result in a 'reactive' component (effectively a waste component) measured in KVAR. The resultant of these 2 numbers is usable power – KW.
The less efficient the users' operations the less KW will be recovered from the total KVA delivered. The further KW and KVA deviate from 1, the more waste is occurring which results in a cost inefficiency. In fact utilities will penalise you with tariffs for PF that are less than a given constant.
(In Johannesburg, City Power will penalise for a PF ('Reactive Energy Charge') of less than 0.96).

Operation scheduling to reduce peak demand

Peak demand is a number you want to keep as low as possible. Often a utility will ask you to predict your peak demand for the year / season ahead, and charge you for this facility. Should you for even a few moments exceed that peak often the utility will impose a ratchet tariff whereby for the rest of the contract period all your billings move up in coordination with that rogue demand load.
To reduce peak demand often smart process scheduling will be effective. For eg, a soccer stadium will never switch on all of its spot lights at once because the start up power demand will be very high – and therefore very expensive.

Energy efficient motors

Technology is incrementally improving the efficiency of electrical motors. Even a 1% improvement in efficiency can delver considerable returns in running cost when one considers that world wide the significant majority of electricity is consumed within electrical motors.
A particularly important consideration here is the variable speed drive (VSD) that allow a motor to operate at variable power outputs depending on the load demand at a given moment. This differs massively from older technology which saw constant speed motors always working at close to 100% output, but geared down for the given load demand.

Product design changes

A complicated area and one to be considered with great care. It can very often be the case that a particular product or component can be manufactured in a different way, or with different materials, characteristics, etc in order that the result is a more energy efficient one.

Air conditioner economisers

Economisers are deployed in a number of ways. Most commonly when outside air temperature is lower than that of the required internal temperature, then the HVAC system will introduce atmospheric air into the facility (or a ratio mix thereof) rather than chilling facility air.
Another interesting aspect of aircon to consider is that in very humid areas it is often necessary to cool the air to a temperature considerably lower than the required end result in order to dry the air sufficiently for it to be comfortable. Once this is achieved the air is re-heated to the desired room temperature. All in all this is a very energy-intensive process and economiser technology / process recipes look to reducing the energy demand to achieve a result.

Radiant heating

In factories, warehouses, entertainment areas,etc, etc where heating is required, the use of infrared spot heaters (and even better, linked to motion sensors) is an efficient option because these units do not heat the air, but only the object (people) who are below them.

Spot ventilation (and air filters)

In a factory where welding or smelting is occurring (for eg) rather than ventilate and cool the entire floor, it can be much more efficient to implement a system providing local control

Insulation
Is often a much neglected area of potential saving, and one that can present a high return. Tanks, boilers, pipes, walls, doors, equipment, roofs, etc are all potential candidates for heat and cooling barrier.

Air compressor intakes (cool)
Compressed air increases in temperature. In industrial applications this has at least 2 implications: the warmer the air the more energy will be required to compress it, and there may be additional cooling / insulation necessary to maintain correct temperatures. Not often realised, but simply sourcing the input air from a cooler location when possible can have a positive impact on energy consumption in the compressing process

Combustion air preheat
The less of its energy that a furnace / boiler must expend on heating its own fuel, the more energy will be available for the task at hand. Pre-heating combustion air is often easily done to great effect.

Control of excess air combustion
Too much air in a combustion process will typically result in a 'lean' burn at too high a heat – which is obviously a waste of energy.

Heat transfer in boilers
The efficiency of a boiler is a function of many variables that include fuel selection, boiler design, fuel and fluid pre-heat systems, water management systems and heat transfer mechanisms. Heat transfer refers to (a) the work that the boiler has been designed to achieve in terms of water (fluid) heating and the efficiency with which this achieved, and (b) the transfer of excess heat to be deployed in a useful fashion elsewhere within the facility.

Return of steam condensate to boilers
As per the air pre-heat above, where the water to be converted to steam is entering the process already at a high temperature, clearly less energy is required to raise it to operations temperature.

Reduction of pressure in air and steam systems
Where a particular system is operating at specs in excess of those required to achieve the result, then energy is being wasted. So adjusting air or steam pressures to a lower setting, while still achieving the result is a good energy management opportunity (EMO).

Heat recovery from air compressors
As mentioned above, compressing air produces heat as a by product. Can this be trapped and put to useful work and thereby improve the efficiency of the entire system?

Leak elimination (steam / water / air)
Obviously system leaks are wasteful. Often however they are not noticed and the resulting implications are not quantified. This is an important EMO.

Waste heat recovery
The logic of the air compressors (above) applies to any area of a system that is producing heat as a by-product. Many examples of this – and often forgotten is chemical reactions.

Covering open tanks
A very simple and very often neglected intervention. Effectively an insulation EMO.