

INDUSTRY TO IDENTIFY THE ENERGY-LOSS IN THEIR UNDER-LOADED EQUIPMENTS

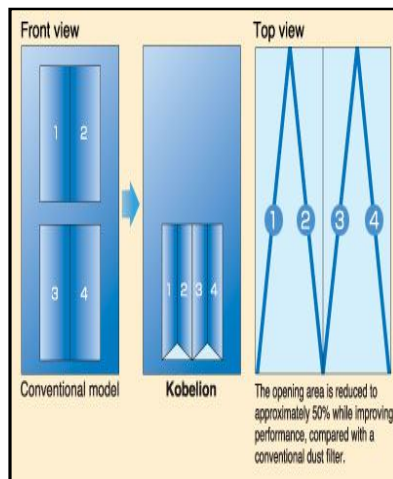
The industry is taking care not to overload the equipments in the production and in the utility considering the safety of the equipments. But, is the same industry monitoring to identify the under-loading of their equipments? At least when the equipments are under-loaded, they need to aware that they lose energy either in that equipment due to its poor loading or in that process loop containing the equipment.

MONITORING OF FANS IN THE AIR-CONDITIONING LOOP:-

Take the case of ventilation and air conditioning systems, the outdoor condenser fans are running at full speed when the heat exchanger fins on the sides of outdoor AC unit is either in clean or choked condition. When the HX fins are clean, the AHU fan takes rated current as mentioned in their commissioning report. If the same HX start to choke due to dust from ambient outside, the fan current drops by say 10 %.

When commissioning, simulate the choke by just spreading a hessian cloth on the fins, we will see the fan current drops by say 10 %. Then retrofit this Under-Current relay in the fan control circuit and set the current setting to say, 90 % of condenser fan motor rated Amps. When the current drops less than 90 %, audio or visual alarm can be given to prompt the user to take up cleaning work. Otherwise the cleaning service gets tough when the same fins are choked heavily with dust gum. This can be avoided by condition monitoring the utility.

CONDITION MONITORING OF FANS :-



As well to prevent this to happen, the user can think of doubled area V shape filter as pre-filter outside the existing fins on the outer cover of the outdoor unit. The user by this, can prolong the choking of the condenser fins from outside, thro out the season. The user can clean the pre-filter once in a week or month suitably.

Condition monitoring of any fan as a system is a practical solution to avoid the above routinely happening problems in the field. But it is practically difficult & costly to monitor the same in small and medium sized utility equipments in a running process plant by retrofitting the pressure or temperature sensor, Delta P or Delta T sensor, etc to primarily sense the amount of air flow to the fan inlet to alarm the user. Alternatively we can add on the existing control circuit, the derivative sensor to check the same by continuously monitoring the running fan motor current using CT / Hall effect current sensors to the fan wiring protection circuit.

UNDER-LOAD SETTING TO INDICATE REFRIGERANT GAS LEAKS:-

The Under Current Relay nowadays that is costing much less than Rs.2000/-, can give the alarm to the user to show the reduction in flow across the fan, pump, blower etc due to filter clog or restricted air or liquid flow thro the system, this din mounted relay can be inserted in the machine control panel effectively as a Condition Monitoring Tool.

The refrigerant used in the split AC, package AC etc sometimes gets leaked minutely over a period. This may happen over a season or few depending on the Freon gas leakage quantity. If the same compressor motor rated current is set in the under current relay say at 80 %, the Freon gas leak will be indicated by this U/C relay and can give audio visual alarm to the user.

COMPREHENSIVE PROTECTION TO OUTDOOR AC UNITS:-

Comprehensive protection in the outdoor equipments is the need of the hour in unmanned areas. When the compressor / fan motor is under loaded, the other unsafe parameters of occasional overloading, single phasing, under loading and the current unbalance etc don't get noticed and this leads to motor failure. Here we can think of adding to existing control circuit, the Electronic Motor Protection relay at a very low cost of less than Rs.3000/- only.

This will definitely replace our conventional thermal relay which frequently fails to respond or fails in safe mode. So the AC equipment OEM can mandatorily fix this Electronic total protection device in their outdoor equipments. The industry faces motor burnouts at the unexpected time during peak hot season at the unexpected location. The retrofit of the low cost electronic protection relay is also indirectly saving to the industry.

CONDITION MONITORING THE COIL COOLER UTILITY:-



Take the coil cooler in the industry utility, the fins often get totally choked within a month and when the HX fins start to choke from outside, the top condenser fan current reduces. We see many a times, the condenser fans will be running ineffectively due to choked fins. The image shows visible block in fins and we need not allow this to happen if we provide daily cleanable V type Pre-filters, to be fitted on the hood. **When this outdoor AC unit is burdened to remove the total heat load from the premises, it is practical thinking to comfort the units by putting under sun shade shelter adequately.**

To improve the efficiency of the coil cooler, many industries are retrofitting in their existing coil cooler, a mist array of water spray so as to approach near the ambient wet bulb temperature. This will definitely make the coil cooler utility more efficient in achieving a wider temperature difference in the heat transfer function. When running in dry ambient outside, this mist spray also aids in clogging of the dust on the fins. So pre-emptive cleaning frequently either daily or weekly; the pre-filter and then the heat transfer fins very much helps to sustain the AC heat transfer efficiency at the outdoor.

MONITORING OF HEAT EXCHANGER FANS IN THE EQUIPMENT SUB SYSTEMS:-

Take the air compressor utility, the user industry argues with the compressor vendor about the input KW to the motor / CFM delivered from the compressor based on the main motor loading, which is practically loaded around 110 to 120 % only catering to the compressed air demands from process and more significantly from compressed air leakages. But the same industry will be surprised to find their oil & air heat exchanger fan motor loading is LESS due to heat exchanger fins choking but the motor will be hotter at 80°C when viewed on the thermal imager. This fan motor current can be monitored by adding the Under-Current relay in the circuit.

AIR COMPRESSOR IN A HOOD IS GENERATES ONLY HOTTER AIR:-

How many of industries monitor the effectiveness of the heat evacuation system of this fan and exhaust duct in the air compressor system? Because the choked oil & air heat exchanger restricts the air passage to exhaust, we find always the air entrapped in the air compressor hood is always hotter by 5 to 10 °C than ambient. This automatically increases the KW of compressor by 2 % due to hot air intake. That is why, they practically keep the air compressor hood side panels fully open always. Here it is likely to choke the HX so it is preferred to retrofit V type filters on all sides to the hood.

So the post air cooler by way of HX inside the hood working is very poor in the industry. **This is a neglected area in compressor house and so the industry has overloaded their refrigerated dryer and that the very hot skin of the main air**

receiver in the compressor house is the symptom of poor heat exchanging happening inside the compressor hood. The compressed air to all the pneumatic equipments needs to cool near to the ambient and dry for healthy pneumatic workings.

PUMP DRY-RUN PROTECTION:-

Similarly, in the pump application in various models like the mono-block pump, submersible pump, centrifugal pump etc can also retrofitted with the under current relay in their panel to alarm or trip the pump on less flow, no flow due to air lock etc . **What is happening now, is that the pump fails due to overheating of poor water flow, air lock etc. The pump needs fool proof protection against Single Phasing, Reverse phasing, over load, under load and the current unbalance sensing & control.**

GOVT TO APPROVE ELECTRONIC PROTECTION RELAY:-

In fact, the Govt can approve of this Electronic Pump protection relay in electronic current sensing mode (instead of thermal sensing type), as the cheap & best mode of fool-proof protection and costing only less than Rs.3000/- including the current sensors in all the agriculture, industry and commercial establishments.

This relay is an Add-on type in the panel. The farmers in the Agriculture segment have made use of this relay since decades, because they too had realized after burning out their deep sub pump motors few times due to the above said reasons. **Decades back, the farmers fixed voltage sensing preventers and since they didn't' protect the pump motor against all the above failures, they had adapted now, to the Electronic current sensing devices to protect their pumps against miscellaneous failures.**

CHEAP & BEST OPTION NOW:-

The industry gives the 'CHEAP & BEST' weightage thinking, only when they procure the gadgets in the protection and ECON segment. 'Cheap & Best' Terms, they never together, but here it is ! Here in the above applications, the protection relay based on the above short cut principle is low cost, easy-to add-on, and this relay too can be used as a protection tool to identify the inefficiency of equipment indirectly running at the under-loading level.

Ashok.S / BEE Accredited Energy Auditor, Coimbatore. / ashok@energymeasuretosave.com

Pls visit the website [www:energymeasuretosave.com](http://www.energymeasuretosave.com) for above practical details / articles on Energy Saving.