

Checklists for Energy Audits

(taken from the *Industrial Energy Audit Guidelines: A Handbook for Energy Auditors*, published by Pusat Tenaga Malaysia, 2003)

Electricity section checklist

No	Items to be checked	Notes
1	Check possible oversizing of transformers within the factory. Note technical parameters of the transformers	
2	Check the voltage at the main consumer to identify bottleneck in distribution system	
3	Check monthly power factor in the invoices	
4	Obtain a list of the largest electricity users	Questionnaire
5	Try to find users which are in operation when not needed and check possibility for shut-down during certain periods	
6	After metering the daily profile (see below) check if there is a potential for load management	
7	If it is the case, explain the importance of load management to the operating staff and discuss which of the users could be shut-off for short time during peaks of demand. Have in mind that operators always are sceptical about shutting-off equipment.	
8	Try to identify loads, which can be shifted to LT-time	
9	Ask the operators to explain the electricity supply system and possible weak points using the single-line diagram	

Steam distribution checklist

No	Steam Generation and distribution	Notes
1	Check if a flow diagram is available in the boiler room and try to obtain a copy	
2	If not available draft a simple one	
3	Look if a logbook is maintained and obtain copies for a typical week	
4	Note the technical specifications of the boilers and burners from their labels	
5	Note the operating pressure and temperature	
6	Check if metering and control instruments are installed and their working condition	
7	Check if there is a hole in the exhaust gas track for the combustion analyser. If not ask operators to drill one.	
8	Check for water and steam leaks	
9	Check if boiler, pipe work and condensate tank are adequately insulated	
10	Check if oil tanks (HFO) and oil pipelines heated by steam or electricity are insulated	
11	Check if housekeeping is adequately done	
12	Identify how much condensate is returned and if it is metered. If not try to estimate by other means.	
13	Check if blow down practice is adequate and blow down valve is not leaking	
14	Check if flue gas dampers are installed in stand by boilers to avoid heat losses	
15	Check the possibility to retrofit boilers with economiser if not equipped already.	
16	Check steam distribution system for proper insulation of pipelines, valves and fittings	
17	Conduct leakage test for steam traps, valves and fittings	
18	Develop Mass And Energy Balance of Boilers in factory	

Compressor checklist

No	Items to be checked	Notes
1	Note the technical characteristics of the compressors and their drives from their labels	
2	Check if the compressors are adequately sized	Check idling time
3	Does the control system of the compressor result to efficient operation. Check idling operation time.	Check idling time
4	Is the pressure set to the lowest level possible to meet the requirements of the users	Check real user requirements
5	Is the intake air being cooled	
6	Check the possibility to decentralise the system if only single users need higher pressure.	
7	Check if compressed air is used only where it is absolutely necessary and unavoidable.	
8	Check if compressed air can be substituted by electricity at individual users	
9	Identify the real pressure requirements of the individual users and check possibilities to reduce pressure in the distribution system or in parts of it by installing throttle valves in branches.	
10	Is the air treatment at a minimum level? Check if only one air user in the system requires high quality air, and consider treatment of that air at the point of use.	

Motor checklist

No	Items to be checked	Notes
1	Note the technical characteristics of the units from their name plates	
2	Consult each motor's instructions for maintenance guidelines. Motors are not all the same. Be careful not to think that what is good for one is good for all. For example, some motors require a periodic greasing of the bearings and some do not.	
3	Clean motor surfaces and ventilation openings periodically, preferably with a vacuum cleaner. Heavy accumulations of dust and lint will result in overheating and premature motor failure	
4	Facility managers should inventory all motors in their facilities, beginning with the largest and those with the longest run-times. This inventory enables facility managers to make informed choices about replacement either before or after motor failure. Field testing motors prior to failure enables the facility manager to properly size replacements to match the actual driven load	
5	Turn off or sequence unnecessary motors.	
6	Check packing for wear and repack as necessary. Consider replacing packing with mechanical seals.	
7	Align the motor coupling to allow for efficient torque transfer to the pump.	
8	Check and secure all motor mountings	
9	Tighten connection terminals as necessary	
10	Inspect bearings and drive belts for wear. Adjust, repair, or replace as necessary.	
11	Check the condition of the motor through temperature or vibration analysis to assure long life.	
12	Unbalanced power can shorten the motor life through excessive heat build up.	
13	Over- or under-voltage situations can shorten the motor life through excessive heat build up.)	

Fan checklist

No	Items to be checked	Notes
1	Turn off or sequence unnecessary compressors.	
2	Complete overall visual inspection to be sure that all equipment is operating and those safety systems for the fans are in place.	
3	Verify proper belt tension and alignment.	
4	Clean and lubricate the pulley wheels where required.	
5	Confirm proper and complete closure control of the dampers. Outside air dampers should be airtight when closed	
6	Observe actuator and linkage control. Verify operation, clean, lubricate, and adjust, as needed.	
7	Check fan blades Validate proper rotation and clean when necessary	
8	Check for gaps and replace filters when they are dirty.	
9	Check for air quality anomalies. Inspect for moisture or growth on walls, ceilings, and carpets. Also inspect the inside and outside of the ductwork. Check for musty smells and listen to occupant complaints.	
10	Verify all electrical connections are tight.	
11	Inspect ductwork. Check and refasten loose connections. Repair all leaks.	
12	Confirm that filters and coils have kept clean, clean as necessary	
13	Inspect, repair, and replace all compromised duct insulation.	

Pump maintenance checklist

No	Items to be checked	Notes
1	Shut down unnecessary pumps	
2	Restore internal clearances if performance has changed	
3	Trim or change impellers if head is larger than necessary.	
4	Control by throttle instead of running wide-open or bypassing flow.	
5	Replace oversized pumps.	
6	Use multiple pumps instead of one large one.	
7	Use a small booster pump.	
8	Change the speed of a pump for the most efficient match of horsepower requirements with output.	
9	Complete overall visual inspection to be sure all equipment is operating and safety systems are in place.	
10	Assure that all bearings are lubricated per the manufacturer's recommendation.	
11	Check packing for wear and repack as necessary. Consider replacing packing with mechanical seals.	
12	Align the pump/motor coupling to allow for efficient torque transfer to the pump.	
13	Check and secure all pump mountings	
14	Inspect bearings and drive belts for wear. Adjust, repair, or replace as necessary.	
15	Check the condition of the motor through temperature or vibration analysis to assure long life	