COMPRESSOR CONDITION MONITORING - TEMPERATURE

- **The Screw Air compressor working in our region has to be tropicalized in such a way that it withstands the high humid & or dusty ambient environment with daily variations in ambient.**

- **The industry needs to understand that compressor is the tool to actuate the final control elements in the automation aspects. And Automation is one of the short cuts to energy conservation preferred by the manager today. Hence it is mandatory for the industry to have Hot & Active Standby compressor. Please put an automatic duty cycle timer to operate hourly the main / standby compressors. This gives increase in volumetric efficiency, sustained KW/CFM than always hot running condition.**

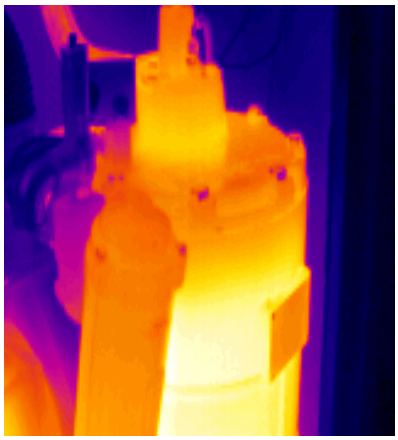
  - **Continuously run Compressor delivers less air than an intermittently run compressor.**
  - **Hourly switched on & off duty cycle Cools the Compressor in between & it delivers more air**

- **Oil is an additive to compress the air coolly and the heat of compression is taken out by the oil circuit thro the oil heat exchanger from skid top. Visualize in the compressor, the compressed air is very hot at the air end, and the heat is exchanged thro oil and air and expelled thro to top of skid.**

  - **Compressor working is like the Submersible pump working in air**
  - **Like water pump, Compressor needs air to suck in, to surround, and so as to deliver more air.**

AIR INTAKE FILTER MOUTH NEAR MOTOR FINS

HOTTER OIL RESERVOIR STARVES INSIDE SKID



PARTLY CHOKED HEAT EXCHANGER in SKID

- **In the first image, compressor air intake sucks the hotter air from the inlet being thrown across motor fins and reaches the air intake cup, which is always hot.**

- **In the second image, the oil in reservoir is very hot due hot air inside, starved inside due to poor oil heat transfer & outside due to poor heat radiation of re-circulated air.**

- **In the third image, oil / post cooler heat exchanger is choked partially inside due to the dirt, dust coming from the air intake opening side and makes it worse.**

- **After providing comfortable surroundings, we find the Compressor skid / canopy is the culprit in the house, internally exhaust hot air and this is being sucked back at compressor suction. So we have to duct out the heat exchanged hot air with expanders & contour duct out of the room.**

- **For healthy system working, compressor Air outlet temperature not to be above 5 * C than air inlet temp. Here the refrigerated dryer gets de-rated at inlet temperature of 45*C and above. The ref dryer outlet temp to be cooler than inlet temp by around 10 *C & be cooler than ambient. The post cooler & dryer, receiver to remove the max moisture from air before going to load.**

What all the temperature monitoring to provide & measure routinely in the compressor house*?*

- **Air intake temperature & RH indicator at the Free Air Delivery point at Suction**
- **Outlet air temp gauge just out of skid, apart from compressor console display.**
- **Though available in console, local operator does not have access to parameters regularly.**
- **Temperature gauge on the air receiver 0 to 80 * C range.**

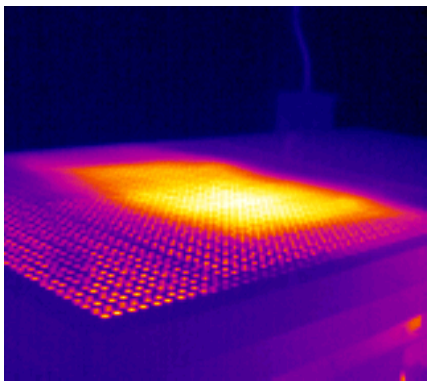
The above three temperatures indicate the compressor's & dryer's health.

- **On the skid top exhaust duct, the temperature of exhausted from the heat exchanger.**
- **The industry to use RTD based digital indication & control on compressor, boiler utility etc.**
- **And for accurate measurement to use temperature compensatory 3 wire system**
- **and drift that happens in thermocouple measurement only & does not happen in RTD**

Temp. Gauges cost hundreds only & what they measure, cost lakhs of Rupees.

RIGHT WAY OF DUCTING

HOTTER AIR @ EXHAUST TOP



V TYPE INTAKE PRE FILTER

- **The first image (image courtesy by TVS group PPT) is the correct installation expanded & long contoured bended duct to outside. Outside also, it is drawn out by few feet with tapered bottom and provided with bird mesh. To have inspection cover / door on the duct.**

- **The second image (courtesy by RN Agencies) is the top view of heat exchanger on skid by thermal imager showing hotter air above 70 *C coming out of the top of compressor canopy without duct and the same hot air short circulates in the room keeping hot, even in cold winter !**

- **The third image is the proposed PRE-FILTER Vee type micro-filter, projected type, with door provision and brush cleanable in & out daily. When this is done, this allows free flow of dust free air inside canopy & well ventilated. Or extend the duct from compressor skid to a cooler location in compressor house & fix this pre-filter. Alternatively, duct can be extended out of building & fit in this pre-filter under a cool, natural shade. This also increases the cleaning interval of main filter.**

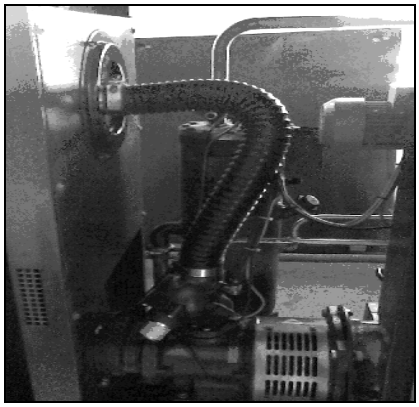
- **Here kindly invest more money to reduce compressor temperatures. We are now Paisa wise, not to invest on compressor comfort measures. This will make us Rupee foolish in the long run due to hot air circulated to compressor, hot air generation, accelerated ageing, more wear & tear in maintenance. "Compress comfortly and Conserve Energy More Please".**

- **May be you feel, that this explanation is excess. Having visited hundreds of compressor user industries, I find ninety out of hundred users have not done this simple ducting out. Either this is not told to them or the idea has not reached the compressor consumer. Invariably, the compressor house is always more by 5* C & above due to this short circuiting inside the house and ultimately, this hot air is only being sucked back as Free Air Delivered to the suction, hot FAD !**

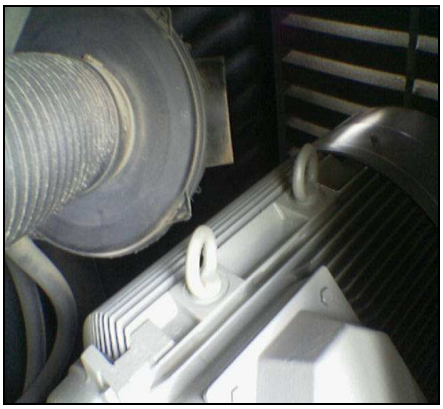
Please grab up to 2 % EASY saving in compressor by Cool Ambient air intake / SURE SHOT !

- **It is also better to insulate the exhaust duct on its outer surface in the room in such a way to minimize the heat radiation from the duct to surrounding. <u>The industry can give attention to this!</u>**

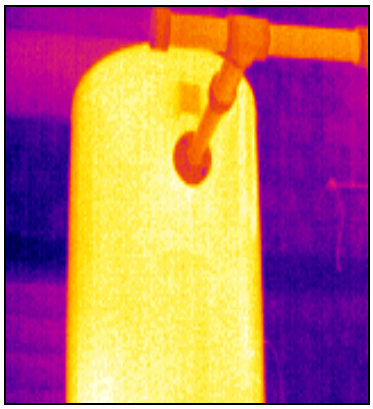
AIR INTAKE FILTER AIR CONTACT AREA BIGGER



AIR INTAKE FILTER NEAR HOT ELEMENT & MOTOR



<u>RESULT:</u> HOTTER AIR RECEIVER



- **In the first image, filter contact area with outside air makes the air intake filter more effective, least pressure drop and is able to deliver the surrounding ambient air directly to the air intake**

- **In the second image, the air intake filter picks up the air from the hotter thin air coming thro motor fins near to compressor element & its temperature goes up fast due to hotter air suction.**

- **The third image is the hot air receiver which is the result of hotter air intake, poor oil to air heat transfer, and <u>thus in a closed loop, air discharge temp is high hence poor volumetric efficiency.</u>**

- **This is as well applicable to refrigerated dryer which refrigerates, say 200 cfm of air down to 3*C and the resultant heat liberated out of refrigeration coming thro hot condenser fin area has to be ducted out. <u>This ref dryer is like an air conditioner only, since it conditions the compressed air. Can we run a window air conditioner inside the compressor house in 24 x 7 hour mode!</u> So it is sensible to duct out condenser heat away or from top or thro roof vent on top of compressor house.**

- **Here, infra red Thermal imaging applies well on the electrical and mechanical, and wetted parts of the plant. <u>The industry can achieve savings up to 3 % in the electrical part itself</u> by engaging this <u>Thermal Imaging services at less than Rs.10 K per day and immediately correcting the hot spots</u>.**

- **It is analogous to our human body circulation system, where the <u>flow of energy when restricted at one point, hot spot symptom of disease starts and spreads from that point. Like wise in the process when the energy flow is restricted at a point, hot spot symptom starts to show the energy losses starting to distribute</u>. In the industry, the energy to carry the raw material to finished product is in the form of air, water, steam, or electricity thro EMF. <u>We, the Energy Auditors look into the symptom of losses which is made visible thro heat, light or sound in excess / abnormal</u>.**

- **Hence in the compressor house, Giving a cool filtered air input to compressor, comforting the compressor to run without suffocation, expelling the heat of compression out of the house are the three main aspects to concentrate easily & regularly and get the best out of the compressor.**

S.ASHOK, BEE certified Energy Auditor/Coimbatore/ Mail - Call - 94437 20220;

- **Pls. visit site <u>www.energymeasuretosave.com</u> for practical energy saving tips.**

Sharing knowledge to SAVE OUR ENERGY !

Conserving Energy is OUR Collective Responsibility, for a Better Tomorrow!