WHY TEXTILE MILLS GIVE PRIORITY TO THEIR COMPRESSED AIR SAVINGS NOW?

The textile mills are aware now that in their total Electricity units consumed per day towards compressed air, they are losing more than 30 % units in compressed air. But, in the total Electricity units per day consumption, the mill can achieve only around 5 to 10 % reduction in that UPD after the energy audit & implementation.

But here in compressed air, they find the Low Hanging Fruit with zero & low cost payback. Compressed air leakage is a hidden losses daily happening in the mill and if not identified and corrected today, this aggravates the losses, which are accelerating now.

When the mill goes for modernization, the automated production demands more compressed air usage. So instead of arresting the existing air leakages, now the mill buys more compressors so satisfy the production demands, but leakage increases more.

WHY LOSSES ARE MORE IN THE COMPRESSED AIR SYSTEM NOW?

The root cause of the problem is that the water & dirt getting accumulated in the compressed air pipe lines are not removed automatically from the pipe lines. The water & dirt in the compressed air pipe lines make the pneumatic fittings weak and leaky over a period of time. Any pneumatic fitting and components has a life and beyond its life, this starts leaking micro way and shortly, these leak heavily.

The compressor post air cooler, refrigerated dryer, and the Zero air loss drain valves fixed in the Air Receivers at the compressor house, Tail end and Feed end Receiver **Fig 1** (shown in last page) the above three sub systems have to work perfectly so that water is not at all trapped into the distribution and load ends. More important, the water ingress in the air actuation elements, solenoid valves etc in the machine will spoil their health.

WHERE IS THE LOSS HAPPENING IN COMPRESSED AIR GENERATION ?

Compressed air generation is Less due to :-

Now compressor takes 5to 10 *C above the surrounding Ambient thro choked air intake filters. This is 2 % KWH loss. Cool dry Compressor delivers more air output. So try to give cool dry air to the compressor air inlet **Fig 5**. Keep the Load / Unload settings to the minimum Bar Pressure just 0.7 Bar i.e.10 % above the minimum required pressure demand from equipments.

Fix pressure gauge one at just after the compressor and other gauge at the compressor house air delivery line / receiver. Fix a temperature gauge on air receiver and its temperature 5 * C above the ambient is a sign of unhealthiness of compressor package.

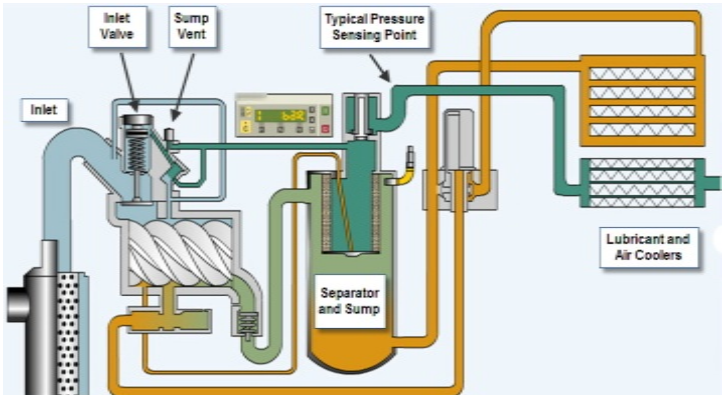


Fig 2. Pressure sensor located inside now.

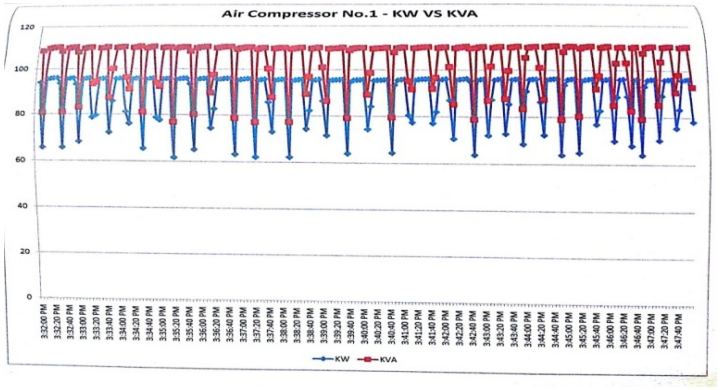


Fig 3. kw Fluctuations in Minute trend graph.

We understand many mills have more pressure drop around 1 to 2 Bar in the compressor house itself. First bring down the pressure drop to less than 0.7 Bar now. We are providing air receiver in the compressor house to arrest the compressed air pulsation and fluctuation due to frequent loading and unloading of compressor.

The above images show that the location of pressure sensor **Fig 2.** matters to us since this aggravates the cyclic fluctuation of load & unload **Fig 3**. This can be solved by shifting the compressed air pressure sensor from the hood to the receiver. Many industries achieved savings and safety after shifting this Pressure Detection & Control Sensor to air receiver. Other comforting option is to expand the compressor hot air exhaust so that the air & oil sub systems within the hood work comfortably.

HOW DO YOU ACCOUNT TH ECOMPRESSED AIR LOSSES IN DISTRIBUTION?

Analogous to the other T & D (Transmission & Distribution) losses, the compressed air lost in the transmission is less up to the sub header, compared to the Air Distribution Loss that is more in the machine. The Flanges, O rings gaskets, fixed in the main header pipe lines are prone to leak more shortly. To study this and correct the same.

Provide Intermediate or Feed Air receiver to each of the air consuming department. This will help the mill to measure separately, the air losses in the transmission (compressor & header) And the losses in the distribution (sub header & equipments at the dept.)

The air receiver to have pressure gauge, isolation ball valve, preferably solenoid operated & receiver water drain valve system. Mill Project team always reduces its budget to invest in these sub systems, but the mill compressed air running cost goes up because of the absence of these field sub systems; which are useful to condition monitor the mill, air daily demand and supply air flow at rated pressure with minimum allowable pressure drops.

ARE WE SEEING COMPRESSED AIR LOSSES IN MACHINE USAGE?

Still I find many mills are operating at 7 to 8 Bar band as load & unload. What is wanted is only 6 to 6.5 Bar as the load & unload pressure settings. Invest in air bottles to each of the compressed air consuming machine. Many mills are fixing digital air pressure gauge (it is the machine OEM initiative) and give only the minimum pressure which is required for the machine.

Say the autoconers can be retrofitted with 3 inch PPR pipe under the total machine length and this will give 200 liter buffer tank. All the control and working pressure tapping can be taken from this retrofit pipe. Mills think of Pressure Booster to satisfy machine OEM's higher pressure demands. Discuss with OEM first, how to reduce the machine operating pressure with spare air bottle as buffer.

HOW TO PRIORITISE THE COMPRESSED AIR LOSSES IN LEAKAGE?

The losses are happening in the compressed air generation, distribution in the usage. In the usage part, the leakage in the machine is more than the machine usage now. Hence the question of arresting the leakage is becoming a priority now. What is the leakage in the machine during OFF time? Measure this first to arrest next.

This is similar to our domestic 1000 liter overhead tank where, 100 liter /hr or (%) water enters the from the top of the tank. 50 liter /hr or (%) is drained silently thro the bottom drain plug. And the balance 50 liter /hr (%) only is used for the house. Like that, some mills record more than 50 % compressed air leakage.

By arresting the leakage losses to the minimum, the mills stand to gain now and ROI, the Return on Investment is around 6 months only. But keep in mind, any mill cant' achieve Zero % leakage practically speaking. So arrest the air leakage to the minimum possible %.

HOW THE AIR CONSUMING MACHINE OEM & COMPRESSOR OEMS CAN HELP NOW?

The machine OEMS in the other segments have realized the preciousness of compressed air. Please try to keep OUT, the air sub header, FRL, etc input components visible to the user daily. Dont' keep the inlet air header under closed door but it must stand out of the machine for easy and timely attendance of air input problems.

Provide a buffer bottle or pipe line so that air supply to the machine individual pneumatic actuation mechanism is not restricted or starved of air. Always give open access to the worker so that he will daily remove the water collected at the machine end water drain valve at the bottom most point. If possible, provide digital air pressure gauge to the machine inlet. Some mills are already planning to put Rotameter type or Digital type air flow instant metering.

Provide Air intake Delta Pressure gauge outside the compressor hood so that each mill can around 2 % KWH on condition monitoring the same. Kindly educate the air consumer on how to keep compressed air useful to the pneumatic machine health.

When installing the machine, give the consumer The BEST Installation Possible. The compressor & compressed air Inefficiency starts from compressor house only to start with. Allow no Tee but Y only, pipe connections in the house.

WHY THE COMPRESSED AIR SYSTEM INSTALLATION IS NOT PROFESSIONAL?

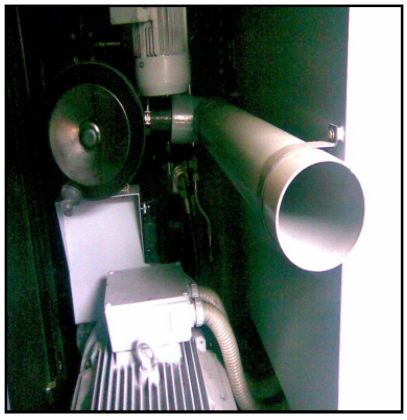
Fig 4. I Image wrongly done and II image rightly done. - Do's & Dont's of compressor hot air Exhaust ducting

On a scale of 10, during my energy audit of more few hundred industries, 8 out of 10 mills have fixed same size duct to match mouth size, but longer lengths **Fig 4**. But they must provide the duct double the mouth size as expanded duct; to exhaust hot air from the compressor hood. That was only cost saving in duct achieved that day, but compressor struggles to breathe forever, the damage done to machine right from the installation!

Mills buy the latest and efficient compressor or machines, they dont' plan to mark a tiny fraction of budget cost towards installation and also; never give time to commission the same professionally.

I request the compressed air users to revisit their compressor installation manuals and commissioning reports and check for Non-conformance. First of all, the mill must have commissioning report of what kw / cfm achieved as told by the OEM? Then, the mill must do FAD test twice a year by pump up capacity method.

I found many mills are forced to change their compressor Air End elements within its life period (its cost is half the compressor cost) prematurely because of this poor installation and the post air cooler is getting choked (this is bound to happen in each textile mill, due to textile micro fluff floating in ambient.) This situation can only improve if the machine HX suction is oriented towards to the outer ambient. If the HX sucks only the machine hot air, then it functions poorly.



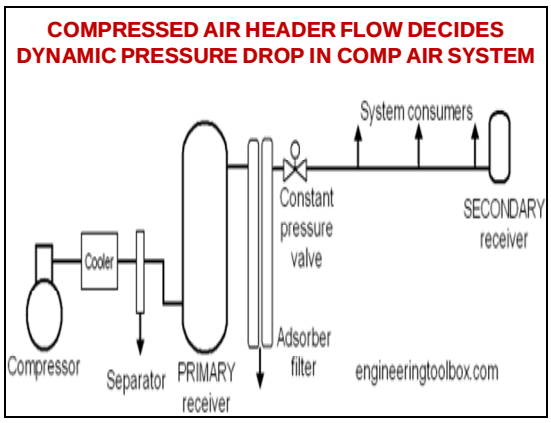


Fig 5. Pre-filter to existing Air intake Filter, pipe Extension to Air Entry. **Fig 1. Invest in Air Receiver - / Tail End model**

DOES COMPRESSED AIR METERING HELP?

As Energy Professional, we are aware that the efficiency of compressed air generation is very poor. So today, first install a Multi function meter to know what is daily kWH of compressor during loading, unloading and total Units. The relative condition monitoring of the machine input KWH will show the relative compressor consumption deviations.

More accurate will be to provide compressed air flow meter in the compressed air main header. This will prompt the user to know what each compressor gives per KWH input power, say 3 to 6 CFM? When the OEM says it is 6 cfm / kw, the mill user finds it around 3 to 5 cfm only per kw.

This input kw / output cfm ratio will indicate the mill user to find out the healthy parameters in each compressor. The user can also close & open the intermediate air receiver valves in each department air to know the individual dept consumption.

So header flow metering will give macro view to the management about the efficacy and % compressor costing in the mill power break up in units / day. And the portable digital flow meter can be used in each machine, to routinely measure the machine air consumption at the ON & OFF time.

WHAT ARE ZERO AND LOW COST WAYS TO REDUCE COMPRESSED AIR CONSUMPTION?

First give priority to leakage arresting first. Outsourcing Today, the Leakage Detection & Correction Exercise will immediately give result in three months. It is a wise decision taken quickly and instantly implementable.

Many mills have stopped one of out of their three daily running compressors after arresting their leakages. Any compressed air pipe line or machine, when you are able to hear the compressed air leak, then it means one third, say 33 % of air flow in that airline is Leaking. First arrest the Audible leaks. Then make use of the ULD - Ultrasonic Leakage Detector to arrest the minute leaks, further.

BEE says, any machine above 10 HP operated for more than 6000 hours an year i.e. two shifts a day, please fix a KWH meter to assess the machine productive health. Here we can measure both compressor's air power and tare power now.

Kindly invest in Air receiver, Other retrofits like comforting the compressor and Zero Air loss compressed air drain valves with a pre-fixed Y type strainer that is daily cleanable on-line to save the main drain valve, Daily cleanable Pre-filter to the existing air intake filter, Positive Cross Ventilation inside the compressor hood, Load & unload Pressure sensor shifting to air receiver etc **many finer points of daily condition monitoring will bring down the mill compressed air energy consumption by ONE THIRD.**

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