

# AIR CONDITIONING AND REFRIGERATION Journal

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Air quantity recorded with filter before cleaning the coil.



Air quantity recorded with filter after cleaning the coil.

## Chemical Cleaning of Finned Coils

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**Many religions give importance to a "fast"(upvas) to earn punya and ultimately to get heavenly happiness. Today, science has accepted that by remaining without food for a day in a month helps clean your body. Our ancient Vaidya, who was a pioneer in medicine Pu. Shri Charak Muni in his Charak Sanhita has given equal importance to fasting followed by special herbal juices or pastes. All this to internally clean your precious body.**

## **Cleaning coils in an air conditioner rejuvenates the performance of the AC in a similar manner, if cleaned at regular intervals.**

Finned cooling coils and air cooled condensers comprise two major heat exchangers in all room air conditioners, most packaged and split air conditioners as well as most packaged chillers used in central plant AC systems. Keeping such finned heat exchangers in prime condition without any substantial loss of heat exchange capacity is the responsibility of the company that maintains the AC through an annual service contract or the maintenance department of a large organization such as a hotel, hospital, office complex or a shopping mall.

Performance of finned cooling coil surfaces is largely dependent on two factors, assuming that the original design of the surface areas is outside the scope of responsibility of the user, his maintenance contractor or the maintenance department:

- maintaining the design airflow across the coil surface
- keeping the finned surface clean and corrosion free

Design air flow, generally 400 cfm/ton for cooling coils in a comfort air conditioning system and 600 cfm/ton for the condenser can be maintained if the static pressure drop across the coil remains unchanged from the original design when the equipment was new and clean. With the normal *indoor* pollutants in the air such as dust, lint and cigarette smoke which manage to get past the air filters (which are usually not very efficient or poorly installed) and the *outdoor air* around the condensers which are surrounded by many other pollutants including automobile exhaust, oil fumes from kitchen exhausts, sand particles, insects and leaves from trees, the finned surfaces get clogged within a short time, leading to increase in pressure drop, reduced air flow and reduced heat transfer.

Cooling coils suffer from another problem in the damp, moist atmosphere along our long coastal areas and the monsoon season and that is condensation. This constant film of water on the finned surfaces helps the growth of fungus and slime which further impairs air flow and worse than that causes the indoor air quality (IAQ) to suffer. This IAQ is the reason why so many persons living and working in air conditioned spaces suffer from allergies in their breathing system.

## **Developing a Coil Cleaner**

Many years ago, the author who is a chemical technologist was contacted by a large company manufacturing, selling and maintaining room air conditioners, packaged air

conditioners and central plants all over India. Their service and maintenance department was having difficulties in keeping finned coil surfaces clean. The normal practice of blowing air at high velocity and splashing water across the coils had very limited effect. The company's engineers were aware that coil cleaning chemicals were available in the US from several companies but since imports were very difficult and expensive during that time, they asked for his help in developing a similar product within the country. Their only specification was *any chemical cleaning material that effectively cleans all impurities from the coil and does not damage or corrode the coil surface and does not leave any odors behind*. It should also be safe in handling and storage and should be a non-irritant, non-polluting and non-flammable.

The company's chemistry team set about the task and came up with a cleaning agent that met all the requirements and which, after several field trials, proved to be the just what the company was looking for. The product has since been in use for the past more than twenty years.

## The Process of Coil Cleaning

The chemical cleaner is first diluted with water in the required proportion specified by the manufacturer, and then liberally sprayed over the coil surface using a hand sprayer, of the type commonly used at home for green plants, or a larger foot-operated spray pump, in case of large air handling units. If the coil surface can be conveniently accessed from both the air entering and leaving sides then the chemical spraying should be carried out from both sides so as to reach deep inside the coil fins. After about ten minutes (will vary depending on how dirty the coil is) of spraying rinse the coil with fresh water till the foam goes away or till the chemical is washed off.



Spraying the coil with cleaning chemical.

Small room airconditioner coils can be thoroughly cleaned by immersing the entire AC (after disconnecting and removing the fan motor, control panel and the electrics) in a tank

containing the diluted chemical, provided the AC can be brought to a workshop for general overhaul and painting.

## Measuring Effectiveness of the Cleaning Process



Measuring air flow after cleaning.

It is commonly said that the proof of the pudding is in the eating. Similarly, how effective is the cleaning work carried out, will show up in the air quantity flowing across the coil / filter area. Hence before the coil cleaning process the air quantity is measured using a vane type anemometer or any other reliable air flow measuring instrument and the quantity recorded. Similar readings are taken after the cleaning is complete and the two readings compared. There should be a noticeable increase in air quantity after cleaning.

**Table 1** shows the two sets of readings on coils of air handling units recorded at various job sites all over India.

**Table 1: Air flow measurements "before" and "after" cleaning at different job sites.**

AHU Size (Location)	Air flow, cfm	
	before	after
AHU 9 (at Delhi)	7,646	10,194
AHU 7 (at Bombay)	8,323	13,920
AHU 7 (at Bombay)	10,045	13,920
AHU 9 (at Jamshedpur)	13,726	14,464
AHU 9 (at Jamshedpur)	13,726	16,605
AHU 9 (at Jamshedpur)	5,097	7,282

Ahmedabad)

## Some Trends Noticed in Coils over the Years

Cooling coils have changed a lot over the years. Copper tubes of 5/8 inch OD have been reduced to 1/2 inch and even 3/8 inch OD (in packaged ACs). Fin spacing which was commonly at 8 fins per inch is now tighter at 10, 12, 14 or even 16 fins per inch. Fin thickness has also reduced so that it is now necessary to use great care in handling the coils to prevent fin damage.

Corrosion problems due to the proximity of the salty sea atmosphere in cities like Mumbai and Goa are common. Fins tends to corrode at the bottom of the coil where they are close to the drain pan. Some suburbs of Mumbai where large shopping malls have come up were originally garbage disposal sites and traces of sulphur dioxide from such sites have caused coil corrosion problems on the exposed air cooled condensers of AC plants. Such corrosion problems are, of course, beyond control and are being mentioned here, merely for the sake of general information.

Larger air-cooled packaged chillers are now extremely common. This increases the work load on the maintenance team because the finned condensers also require to be cleaned regularly to maintain head pressures within limits.