



### **C21 Air Conditioner Compressor Blasts Taking Lives in India: A Forensic Analysis**

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After attending this presentation, attendees will have a better understanding of the various causes behind the compressor blast of air conditioners (ACs).

This presentation will impact the forensic science community by improving awareness of the fact that AC compressor blasts, though rare, are a harsh reality in a country like India. Recently, India has witnessed a surge in fatalities due to AC compressor blast. One important reason behind these incidences is non-adherence of safety guidelines by compressor manufactures. Strict adherence to safety guidelines by manufacturer companies and engagement of well-trained, qualified professionals in AC repair jobs will definitely prevent such horrific incidences.

Worldwide, two types of household air conditioners are used: one is a window unit and the other is a split unit. The basic difference between the two is that a split AC has its compressor unit installed outside the room, whereas in a window AC, the entire assembly is installed at the window. Primarily, both consist of an evaporator, which receives the liquid refrigerant; a condenser, which facilitates heat transfer; one expansion valve, which regulates refrigerant flow into the evaporator; and one compressor, a pump that pressurizes refrigerant.

The focus of this presentation is on the workings of the compressor for the AC unit. The compressor is actually a large electric pump that pressurizes the refrigerant gas as part of the process of turning it back into a liquid. A typical AC compressor has two openings in the form of an inlet and an outlet (Figure 1).

The chief reason for AC compressor blast is extremely high pressure generated inadvertently by the use of dry nitrogen inside the compressor chamber while checking for leaks. Normally, AC compressors are capable of functioning at gauge pressure of about 1,000 pascals, but when it rises dangerously to 2,000 pascals, then a blast occurs. Most of the modern sophisticated compressors are equipped with safety valves which function to alleviate excess pressure. If the valve becomes dysfunctional due to a clogged pipe or if the compressor is not equipped with safety valves, then excess pressure causes the compressor blast.

In this instance, when the repairman reached the jewelry shop, he was allegedly unaware of the fact that the compressor had already been, filled with dry nitrogen by another repairman prior to his visit. The moment he asked to switch on the AC unit, the blast occurred. Figure 2 shows the remnant of the compressor at the site. The blast was of such high intensity that a substantial part of his skull was blown off and all brain matter was discharged (Figure 3).

Another factor which may be responsible for such blasts is the use of oxygen instead of dry nitrogen to check leaks in the compressor. When oxygen combines with the compressor oil and a fire source is introduced, a compressor explosion occurs.

India is a developing country where ill or inadequately trained youths enter the AC repair market to earn a living, without knowing the potential hazards of their job. Only certified persons who take formal training from recognized institutes for AC repair should be hired. In addition, every compressor manufactured should comply with safety guidelines recommended by ANSI/AHRI Standard 210/240 (Air Conditioning, Heating and Refrigeration Institute).



Figure 1: AC compressor showing inlet and outlet.



Fig. 2: Remnant of compressor (black in color) at blast site.



**Fig. 3: Substantial part of skull was blown off and brain matter was discharged from the cranial cavity.**

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