

Catalytic converter: a great allied at polluting gases.

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As of the 1950's, after World War II, Brazil took part in a big industrialization process, most of all automotive industries which, attracted by cheap and abundant man labor, as well as a promising and unexplored market, came in a great numbers to the country, mainly to the Southeastern region. Up until then, other means of transportation which polluted less, such as trains and trams, were the most used. From then on, the amount of vehicles on the streets of big cities has increased steadily not only in Brazil, but also in other cities around the world. Today an estimated fleet of over 500 million cars ride on the streets and avenues of the five continents. This growing number of vehicles along with a high concentration of manufacturing industries caused the amount of pollutants thrown daily into the atmosphere to reach a very high level, thereby, seriously harming people's health.

The atmosphere became one of the most convenient places for depositing undesirable materials, due to the fast movement of its fluid mean, causing a great number of environmental problems. Acid rain and greenhouse effect are presently among the main problems, this last one is caused by gases which are both chemically stable and inert enough to accumulate in the atmosphere, such as carbon dioxide, methane, nitrogen oxides, and the chlorofluorocarbons - CFC's. The automobile is one of the agents which most contributes towards air pollution. This can easily be observed in urban areas where smog, which is a result of the interaction among nitrogen oxides, hydrocarbons and sun light (ultraviolet rays), results in oxidation products, that cause sore eyes, respiratory difficulties and damage to plants.

Otto cycle engines (combustion engines present in automobiles) generates in its exhaust a complex mixture of pollutants constituted by carbon monoxide and dioxide, nitrogen oxides, hydrocarbons and sulfur dioxide contributing directly towards smog and other types of pollution. The concentration of these compounds, above acceptable levels, interferes directly in the life quality of the big

city inhabitants, since these pollutants affect their respiratory system and, consequently, their health.

Starting in the 70's, aiming to lessen the present of these pollutants in the atmosphere, some countries establish restrictive legislation regarding CO, NO_x and hydrocarbons emissions. This fact motivated the development of the catalytic converter which is presently used worldwide.

But, after all, what is a catalytic converter? It's a device located in the car's exhaust system, soon after the gas collector and near the engine to take better advantage of the temperature resulting from the combustion to convert the toxic gases generated at the combustion – CO, NO_x and hydrocarbons – in less pollutants gases such as CO₂, N₂ and H₂O_(v). To convert the gases generated, the catalytic converter performs a series of chemical reactions in its interior which uses, as a support, a ceramic material in the shape of a beehive: cordierite – (Mg, Fe)₂Al₄Si₅O₁₈.nH₂O. This transformation of the gases has no relationship to the filter. The catalytic material is deposited in this support (where chemical reactions will occur) composed of alumina with high specific area, over which actives elements such as Platinum (Pt), Palladium (Pd), Rhodium (Rh) and promoters, like CeO₂, aside from other elements such as Nickel (Ni), Zirconium (Zr), Barium (Ba) and Lanthanum (La).

Basically, the catalytic effect of this catalytic converter is due to the noble metals aided by CeO₂, the desired products, (carbon dioxide, nitrogen and water steam), are thermodynamically favored at typical exhaust temperatures, (770K), that's why the catalytic converter is located near the engine, to make better use of the heat generated by it and reach the ideal temperature that will make the reactions take place.

In Brazil, the control of the gases generated by vehicles started in 1997 with the air pollution control program called PROCONVE that obliged the manufactures to install the catalytic converter in all

manufactured vehicles in order to reduce the pollutants emitted by them. Programs like this, along with others, connected to the most diverse industries installed in Brazil, have contributed to improve the quality of the air in the last few

years, causing fewer hazards to the health of our population.

What would the quality of the air in big cities be like without the presence of catalytic converter? Let's not even imagine!

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