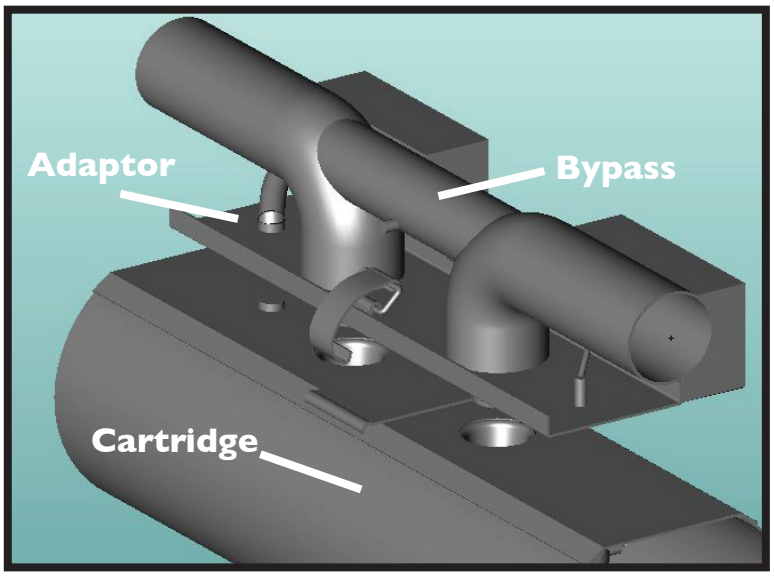
An Adaptable System for supplementary treatment of exhaust gas

Auto Emission Post Regulator (AEPR)

Originally intended for cars, now has expanded and is adaptable to virtually any exhaust chain. (An "exhaust chain" as used in this document refers to one or more devices interconnected by pipes from an exhaust source to the exit point. Sources can include anything from as small as lawn mowers to large diesels.) The system is intended to be utilized both as OEM or after-market, but its strongest potential is as a retrofit product. The purpose is to provide for the rapid dissemination, maintenance and rapid proliferation of new exhaust treatment technology especially in the after-market where provisions for the dissemination of supplementary technology is glaringly absent, and where the potential for benefit is the greatest.

In its generic form AEPR is comprised of:



An Adaptor that interfaces the Cartridge:

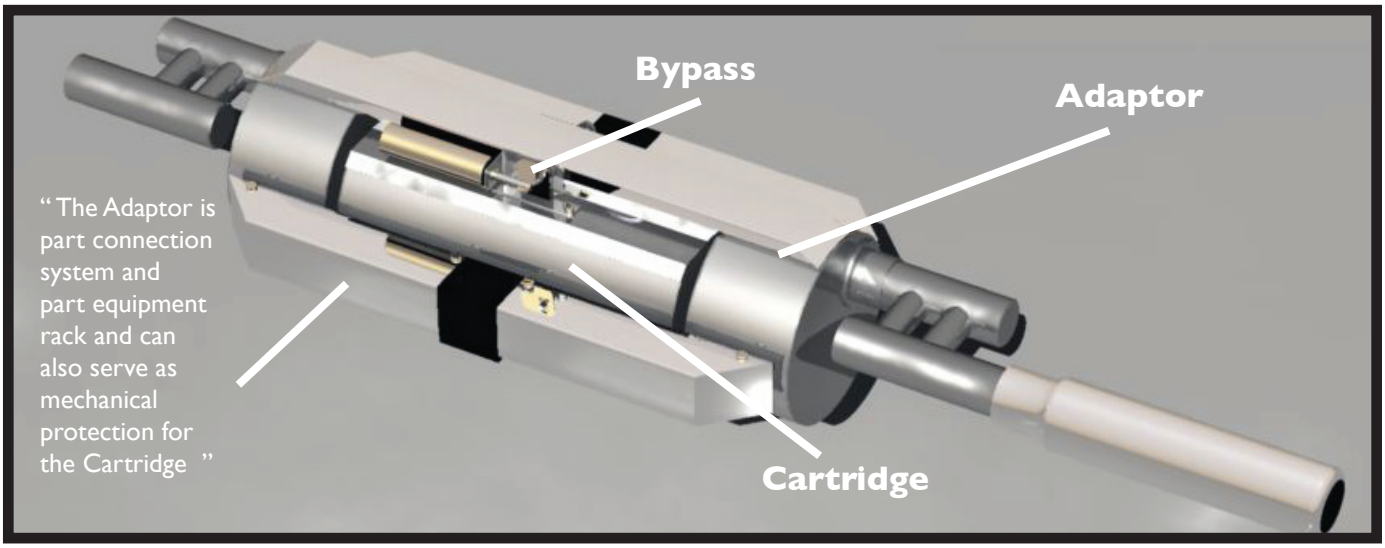
Complementary to the Cartridge is an Adaptor that interfaces the Cartridge to the host exhaust pipe. The Adaptor houses the mating half of the connection system, and has the retention mechanism that makes tool free interchangeability possible. The Adaptor is part connection system and part equipment rack and can also serve as mechanical protection for the Cartridge. Unlike the Cartridge, once installed it is expected to remain as a permanent fixture, thus any auxiliary equipment required by new generations of Cartridge are provided for. Initial emphasis on the Adaptor is ease of installation, minimizing the tooling and skill to accomplish.

A container, referred to as a "Cartridge":

Sealed, except for exhaust inlet and outlet, equipped with gas tight connectors, such that connection can made or broken without the use of tools. The container, or Cartridge houses the exhaust treatment technology, and , also has provision for electrical connection, and connection for smaller tubes in support of a process that may require it.

A Bypass:

Typically an implementation of the AEPR will include a bypass valve either in the Cartridge or in the Adaptor, partly for safety reasons and and partly for the beneficial effects. This valve is closed only if the system is working properly and no preset alarm or operating conditions are detected.



Using the AEPR to reduce Emissions
An Example case

Targeting the emissions

Current systems based on the catalytic converter and closed loop engine controls operate best hot and during steady state conditions. Where they do not operate well is during warm up, while the catalytic converter is below operating temperature, in transient conditions such as acceleration, shifting , basically transient conditions where the response of engine controls have not stabilized; as is often the case when surging in stop and go traffic. It has been postulated that 30%-40% of the fuel we burn is burned while going nowhere. During these times, particularly in the winter, in most of the country, vehicles will experience conditions where the catalytic systems are outside optimum operating temperature range. Keeping the problem definition brief, it is reasonable to expect, particularly considering that most of the cars on the road are aged and in some state of wear-out, that nearly half of our fuel is burned with under performing emission control systems and may well be responsible for the majority of the pollution in our cities.

To demonstrate the versatility of the AEPR System, and to harvest the maximum benefit we will target this yet to be conquered component to pollution.

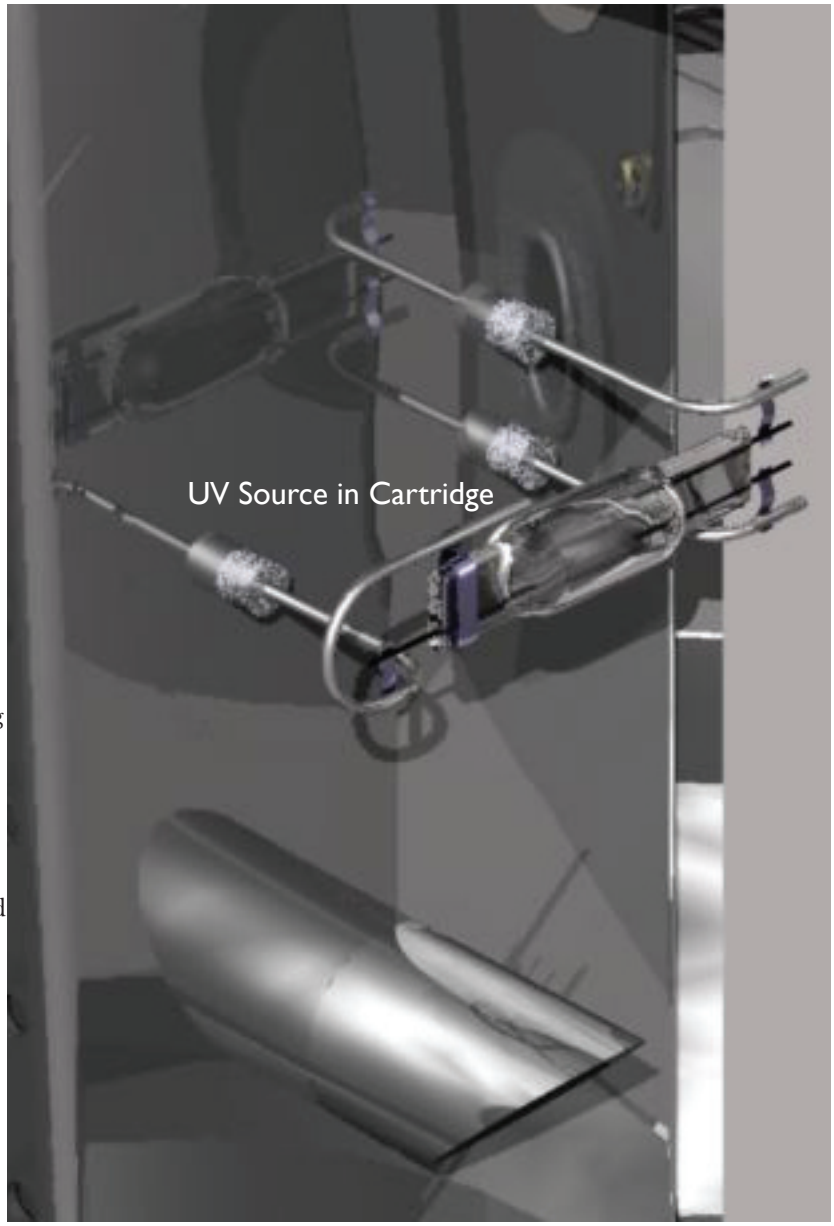
Using the AEPR to implement a solution

We will design a complimentary system, one which works best when it is cold, and implement it in an AEPR System, so together with the catalytic system, the morning commute will see an overall reduction in emissions.

For this implementation we will select NOx and particulate (smoke) as our primary target emissions to reduce. A large component of exhaust is water vapor. During warm up, and idling in cool weather produces significant condensation in the exhaust system, evidenced by steam and water dripping from the tail pipe. This can be used to advantage, along with some others. Here's how:

NOx produced by the engine is only slightly soluble, which is why the majority makes it out the tail pipe into the atmosphere. But with addition of an ultra violet light source inside, the NOx in the presence of the water vapor and residual Oxygen is rendered nearly very highly soluble. (90%+ removal has been demonstrated by this method.) With the ultra violet source in the Cartridge, and the condensation whetting the surfaces, the vapor will dissolve forming a reactive and corrosive mixture (ordinarily responsible for corroding the muffler) which can be neutralized by introducing a sacrificial material (usually alkaline, that can preferentially produce useful compounds with the NOx, in which case the by product would be harvested during the next maintenance cycle.)

Additionally, aerosols (small suspended particles, smoke and particulate matter) have a strong tendency to migrate to cooler surfaces (even with the exhaust speeding out of the tail pipe, the aerosols still deposit in the cooler metal to provide the black lining we see on the inside of the tail pipe) with the aid of electrostatic potential superimposed on the power provided to the ultraviolet source will given to

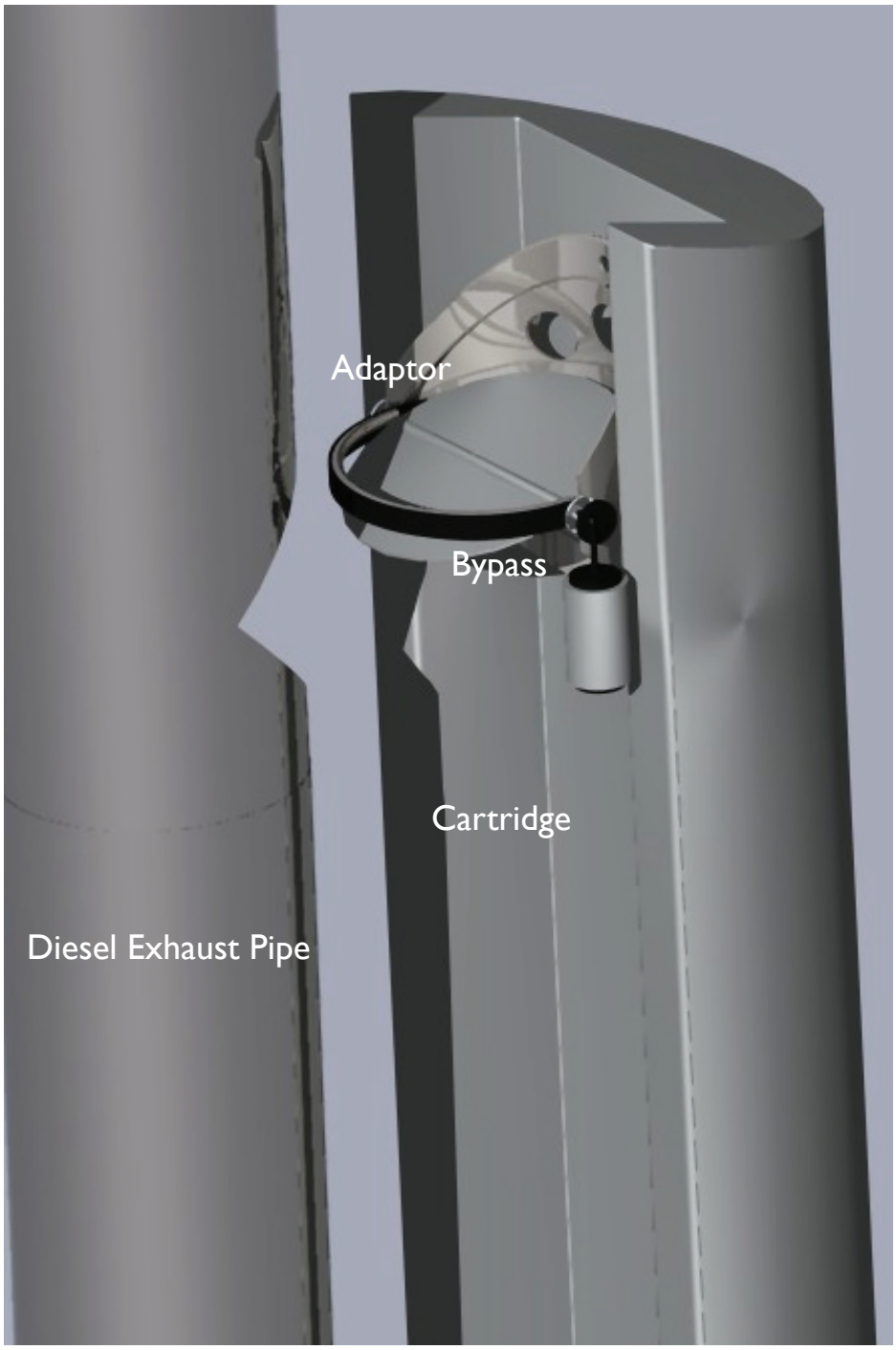


preferentially adhere to the moist wall inside the Cartridge.
Concern over the ultra violet source being blackened by soot are unnecessary, since the UV source runs red hot and will for the most part repel deposits, and incinerate all others.

The beneficial effect that the UV source provides is at a low cost of 40 Watts, which is no more power than the brake light, has a life expectancy on the order of 10,000 hours, and the power supply to drive it is virtually off the shelf and mature low cost technology.

Supervisory control is provided by microchip (again mature technology costing no more than a dollar or two) house in a compartment in the Adaptor Equipment Rack. Main function here will be preserve the moist conditions within the Cartridge.

An AEPR system configured to fit on an exhaust pipe of a diesel. This provides the additional benefit of providing additional muffling during braking, thus reducing appreciably the noise of " engine brakes".



AEPR System as applied to diesel

This short tutorial has demonstrated how the AEPR System can be targeted toward a specific problem area
How the targeted AEPR System is implemented with off the shelf cost effective components, and can be done relatively quickly.
Providing an AEPR System based product with good profit potential.