



TR-398

ZEROS: The Zero-emission Energy Recycling Oxidation System, A Description for Non-Engineers

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ZEROS (Zero-emission Energy Recycling Oxidation System) is an innovative “oxy-fuel” technology that uses pure oxygen to completely oxidize a variety of organic/hydrocarbon fuels with no air or water emissions and with complete sequestration of CO₂. ZEROS technology was developed, patented, and commercialized in the late 1980s and 1990s by Mr. Steve L. Clark to clean up oilfield waste without producing atmospheric emissions or water pollution.

ZEROS combines several well-known technologies into a unique system with many advantages. Fuels are oxidized with pure oxygen from a co-located air separation unit. Initial gasification—partial oxidation of the fuels—is accomplished in the primary reaction vessel, a rotary kiln. The synthesis gas that is produced in the rotary kiln (primarily CO, CO₂, CH₄, H₂, and H₂O) moves either

1. to a secondary reaction vessel where it is completely oxidized with pure oxygen to CO₂ and H₂O (which are captured as pure liquid (or solid) CO₂ and distilled water) and the heat released is used to drive a steam turbine and electrical generator or
2. to a steam reformer and a modified, carbon-recycling Fischer-Tropsch reaction vessel to produce diesel fuel.

By using pure oxygen as the oxidant, the system can use low quality fuels that normally would not be considered for traditional incineration technologies. A variety of organic materials—including coal, lignite, municipal solid waste, wood waste, scrap tires, agricultural and forestry biomass, animal manure, sewage sludge, and a number of hazardous organic wastes—can be used as feedstocks to power the system. Finally, a ZEROS facility has no smokestack and has no air or water emissions; it captures and renders harmless all oxides of nitrogen and sulfur, heavy metals, organic compounds, and other potential contaminants, including asbestos.

The ZEROS process is currently being commercialized in projects designed to produce up to 100,000,000 million gallons of diesel fuel per year and up to 50 MW (gross) of base load electrical energy. All CO2 produced by the facility will be captured for sale/sequestration, mostly for enhanced crude oil recovery in mature oil fields. In addition, commercial quantities of pure N2, Ar2, distilled H2O, and several minor products will be sold through existing markets. These facilities will produce no air or water emissions, including the greenhouse gas CO2.

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