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A conceptual plasma exhaust system for the Laser Inertial Fusion Engine (LIFE) ALEXANDER IRIZA, CHARLES GENTILE, WILLIAM BLANCHARD, THOMAS KOZUB, Princeton Plasma Physics Laboratory — The Laser Inertial Fusion Engine (LIFE) project proposes the construction of an indirect-drive inertial fusion reactor for the generation of electrical energy. LIFE will use hohlraum targets containing a deuterium-tritium fuel mixture which will be ignited by lasers at a rate of 16 times per second. In order to shield the first wall from high-energy x-rays and ions, the reactor vessel will be filled with an intervention gas of xenon. The average xenon density from the center to the first wall must be at least 8 $\frac{g}{m^3}$ to ensure sufficient stopping power, while, because of nuclear exposure concerns, the amount of tritium in the vessel must not exceed 10 g. A conceptual design of the LIFE exhaust-processing system is undertaken with a focus on assessing its efficacy in meeting these two requirements simultaneously. A model of the density profile within the vessel indicates that an exhaust rate at the first wall of at least 26 $\frac{m^3}{s}$ is necessary to keep the tritium inventory below 10 g. At this rate, in order to maintain the required xenon density, approximately 40 tons of xenon will need to be exhausted, processed, and recirculated each day. This paper will discuss the operating parameters of this progenitor system for this and future IFE fusion reactors.

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