

Magnox Fuel

Engineering
Services

Background

Magnox fuel was used in the world's first industrial-scale nuclear power station at Calder Hall. In all, 26 Magnox reactors have been built and operated in the U.K. since 1956. The name Magnox originates from the use of magnesium alloy as a casing for the fuel rod. Although similar in appearance, the design of each Magnox fuel element is tailored for different reactors.



BNFL operates all of the Magnox power stations in the U.K.

Manufacturing Magnox Fuel

A Magnox fuel element about 1-metre long containing natural uranium fuel produces the same amount of electricity as 150 tonnes of coal.



Assembly of Magnox fuel elements

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Uranium Metal Fuel

Westinghouse Springfields manufactures natural uranium metal fuel clad in Magnox (magnesium alloy) fuel cans for the first generation of U.K. nuclear power stations. A Magnox fuel element consists of a uranium metal fuel rod encased in a magnesium alloy can.

Conversion, Casting, and Canning

Uranium tetrafluoride (UF_4) is converted to uranium metal for Magnox fuel by mixing it with magnesium metal. When heated in a furnace to $600^\circ C$, the UF_4 and magnesium react together. Uranium melts and flows into a catchpot at the bottom of the furnace and a layer of fluoride slag forms on the top. After cooling, the billet of uranium is separated from the slag, remelted, and cast into rods.

How Magnox Fuel is Produced

- Chemically process uranium ore to produce UF_4
- Reaction to UF_6
- Casting and machining fuel rods
- Canning Magnox fuel
- Delivery to Magnox reactor

The cast uranium rods are machined to size and length, and diameter-grooved before being polished and degreased. On arrival at the canning plant, the uranium metal rods are then inserted into magnesium alloy cans and fitted with end caps.



Uranium metal fuel rods machined before insertion into Magnox cans

Quality Assurance

Rigorous testing and quality assurance procedures ensure that the fuel element is finally inspected and packed for transportation to a Magnox power station.

Magnox manufacturing plants have been extensively renovated, ensuring that fuel of the highest quality continues to be effectively made. To date, more than 4,000,000 elements have been made.



Magnox fuel elements produced at Springfields

Westinghouse Electric Company
Box 355
Pittsburgh, PA 15230

www.westinghousenuclear.com

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