Mekanism Fission Reactor Guide | Stoneblock 4

> The Fission Reactor is a multiblock structure, in the Mekanism mod, used to generate large amounts of power by burning Fissile Fuel. The reactor converts water into steam for power generation in a Steam Turbine, through heat generation. It also generates nuclear waste as a by-product.

Overview

Mekanism's Fission Reactor takes Fissile Fuel and coolant and converts them into Nuclear Waste and hot coolant. The reactor does not generate power on its own, instead it produces steam, which must be piped into an Industrial Turbine to generate energy.

The reactor accepts two coolant types: Water Cooling, which is simpler to set up but less effective, and Sodium Cooling, which is stronger but requires an additional multiblock to support it. Fission Reactors can be built at sizes ranging from a minimum of 3x4x3 up to 18x18x18, with larger builds increasing fuel burn rate, output, and the speed at which problems can escalate if coolant or waste management is neglected.

Materials & Components

The components below details how many you will need to create a small reactor (3x4x3), medium reactor (12x12x12), and a large reactor (18x18x18), with Fission Reactor Casings covering the top, bottom, and edges, Reactor Glass windows on all four faces, and a minimum of 4 ports, for coolant input, fuel input, steam output, and waste output.

Small Reactor (3x4x3) ?

Component	Quantity
Fission Reactor Casings	26
Reactor Glass	4
Fission Reactor Ports	4
Fission Fuel Assemblies	1

Control Rod Assemblies	1

At this size all flexible face slots are already used by the 4 Ports and 4 Reactor Glass, so there is no spare room for additional components such as the Fission Reactor Logic Adapter, on the side faces. The top, bottom, and edges remain mandatory Fission Reactor Casings regardless of size.

Medium Reactor (12x12x12) ?

Component	Quantity
Fission Reactor Casings	328
Reactor Glass	396
Fission Reactor Ports	4
Fission Fuel Assemblies	450
Control Rod Assemblies	50

The top, bottom, and four corner columns are mandatory Fission Reactor Casings. One Reactor Glass window has been placed on each of the four sides for visibility, with the minimum 4 Fission Reactor Ports. There are many spaces for Fission Reactor Logic Adapters.

Large Reactor (18x18x18) ?

Component	Quantity
Fission Reactor Casings	712
Reactor Glass	1,020
Fission Reactor Ports	4
Fission Fuel Assemblies	1,920
Control Rod Assemblies	128

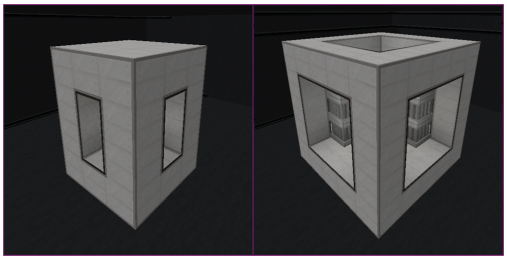
18x18x18 is the maximum possible Fission Reactor size. The top, bottom, and edges are mandatory Fission Reactor Casings. There is one Reactor Glass window placed on each of the sides for visibility, with the minimum 4 Fission Reactor Ports. There are many spaces for Fission Reactor Logic Adapters.

Construction

The inner sections of the reactor frame can be replaced with Reactor Glass, Fission Reactor Ports, or Fission Reactor Logic Adapters, rather than being solid Reactor Casings throughout. Inside the reactor, fission control rods must be added, each built from one or more Fission Fuel Assemblies with a single Control Rod Assembly placed on top. Control Rods should not be placed touching each other, as this penalises the reactor's cooling.

Step 1: Frame and Ports

The Edges of the Fission Reactor must be made from Fission Reactor Casings, this does not include the middle of the top and bottom of the reactor.



3x4x3 Fission Reactor | 5x5x5 Fission Reactor

Each reactor should be equipped with 4 Fission Reactor Ports, for coolant input, fuel input, steam output, and waste output. The Fission Reactor Ports type can be changed using a Configurator (Mekanism's wrench) set to any mode other than Wrench, Rotate, or Empty. When configuring the Fission Reactor Ports they will change colour based on what they are set to do:

Green: Input Only (Fissile Fuel and Coolant)
Yellow: Output Waste (Nuclear Waste)
Blue: Output Coolant (Steam)

Step 2: Core Placement

Fission Fuel Assemblies are placed on the reactor floor in a checked pattern, alternating with empty air gaps for the most efficient set up. Each occupied position is then built upward as a single column of Fission Fuel Assemblies, with one Control Rod Assembly placed on top of each column, and a Fission Reactor Casing or Reactor Glass to cap it. The height of each column is determined by the reactor's interior height, with the topmost block always being the Control Rod Assembly and every block beneath it a Fuel Assembly.

Step 3: Activation

If the multiblock is built successfully Redstone particles will appear temporarily, and right-clicking the reactor will open up its GUI.

Moving Steam into an Industrial Turbine

A Fission Reactor produces Steam but does not generate power itself, so the Steam output must be piped into an Industrial Turbine to actually convert it into energy. The reactor needs at least one Fission Reactor Port set to Output Coolant, with Pressurized Tubes running from that port to the turbine's Turbine Valve.

Because reactors can produce very large volumes of Steam at higher burn rates, it is worth checking that the connecting Pressurized Tubes are sized to handle the reactor's maximum Steam output, not just the rate it happens to be running at when first connected. A tube network that is undersized will bottleneck Steam, but this will not cause any damage, it will just be inefficient.

Fuelling

Fission Reactors use Fissile Fuel only as it's fuel type, which is produced through a long chemical chain. To input the fuel into the reactor you will need to use a Fission Reactor Port set to Input Only.

Fuel Production

To set up the chemical chain to create Fissile Fuel you will need the following machines:

- 1x Electrolytic Separator
- 3x Chemical Infuser
- 2x Chemical Oxidizer
- 1x Rotary Condensentrator
- 1x Chemical Dissolution Chamber
- 1x Enriching Factory
- 1x Isotopic Centrifuge

Chemical Chain

Step	Machine	Input(s)	Output
1	Electrolytic Separator	Water	**Hydrogen, Oxygen**
2	Chemical Oxidizer	Sulfur	**Sulfur Dioxide**
3	Chemical Infuser	Oxygen, Sulfur Dioxide	**Sulfur Trioxide**
4	Rotary Condensentrator	Water	**Water Vapor**

Step	Machine	Input(s)	Output
5	Chemical Infuser	Sulfur Trioxide, Water Vapor	**Sulfuric Acid**
6	Chemical Dissolution Chamber	Sulfuric Acid, Fluorite Gems	**Hydrofluoric Acid**
7	Enriching Factory	Uranium Ingots	**Yellow Cake Uranium**
8	Chemical Oxidizer	Yellow Cake Uranium	**Uranium Oxide**
9	Chemical Infuser	Hydrofluoric Acid, Uranium Oxide	**Uranium Hexafluoride**
10	Isotopic Centrifuge	Uranium Hexafluoride	**Fissile Fuel**

During production, you will have excess oxygen, which can either be stored in tanks or a storage system such as an ME System, or can be voided using a Fluid Trash Can.

Cooling

Fission Reactors use two types of coolants, water, and sodium. Water is the easiest coolant, it can be piped in from any type of source and will cool 20,000 mB/t when burn rate is at 1 mB/t . Sodium is more involved, needing a whole new process to create it, but once created it can cool the reactor at a rate of 200,000 mB/t when burn rate is at 1 mB/t, a 100% increase from water cooling. To input the coolant into the reactor you will need to use a Fission Reactor Port set to Input Only.

Water Production

Stoneblock 4 offers several different ways of getting infinite water sources. Commonly, an ME Infinite Water Cell from the Echo of The Catalyst, bought for 50 coins, is ported out of an ME System through the use of Fluix Cables and Export Buses, with added Acceleration Cards for an unlimited and fast supply of water. However, Stoneblock 4 offers a new way of piping infinite water from Pitcher Plants, obtainable from the Wandering Trader. These plants act like infinite storage tanks, and are able to be connected to from all sides.

Sodium Production

To set up the chemical chain to create Sodium you will need the following machines:

- 1x Thermal Evaporation Plant (4x3x4) *Multiblock - Can be scaled up to 4x18x4*
  - 1x Thermal Evaporation Controller

    - 3x Thermal Evaporation Valve
    - 32x Thermal Evaporation Block
- 1x Resistive Heater
- 1x Water Source
- 1x Electrolytic Separator

> The Thermal Evaporation Plant can use Structural Glass the same way the Fission Reactor can use Reactor Glass.

Chemical Chain

Step	Machine	Input(s)	Output
1	Thermal Evaporation Plant	Water, Heat	**Brine**
2	Electrolytic Separator	Brine	**Sodium, Chlorine**

During production, you will create Chlorine as a byproduct, which can either be stored in tanks or a storage system such as an ME System, or can be voided using a Fluid Trash Can.

Operation & Output

A Fission Reactor does not generate power on its own. It produces steam, which must be piped into an Industrial Turbine to actually generate energy. The reactor burns Fissile Fuel at a configurable rate, up to a maximum of 1mB per Fission Fuel Assembly per tick, down to a minimum of 0.1mB per tick. Increasing the burn rate increases steam output, but also increases coolant demand and the rate at which nuclear waste accumulates, so all three need to scale together.

Monitoring with Logic Adapters

Fission Reactor Logic Adapters can be attached to the reactor the same way Fission Reactor Ports are and will read live information such as when the Reactor is activated or deactivated, when it reaches dangerous temperatures, critical levels of Nuclear Waste, critical damage, and insufficient fuel. They can also be used to turn the reactor on and off automatically, or remotely.

These are commonly used to build a simple safety circuit, where the reactor is shut off automatically if temperature or damage crosses a set threshold, rather than relying on a player noticing in time. Additionally, players can wire an Industrial Alarm to the Fission Reactor Logic Adapter, which will trigger, when activated via a Redstone signal, giving an audio cue that something is wrong with the reactor.

Safety & Common Issues

When a reactor doesn't get enough coolant it won't stop running, instead it will cause the reactor to overheat, take damage, and eventually explode if it is not turned off soon enough, releasing radioactive material into the surrounding area. Additionally, failing to empty the waste tank causes waste to leak into the environment and accumulate as radiation, even without an explosion.

Waste Handling

The primary way to handle Nuclear Waste is to store it in a Radioactive Waste Barrel, this can be done by transferring it using a Fission Reactor Port set to Output Waste and piping it out through Pressurized Tubes. Alternatively, it can be piped into an ME System if a ME Fluid Storage Cell is fitted into an ME Drive.

Nuclear Waste, and Spent Nuclear Waste, will decay inside a Radioactive Waste Barrel overtime at a rate of 1 mB / 20 ticks. Breaking a Radioactive Waste Barrel will cause it's contents to spill into the atmosphere creating radiation.

Insufficient Cooling

When the coolant supply cannot keep up with the reactor's burn rate, the reactor's internal temperature begins to climb instead of stabilising. This usually happens when the amount of coolant being inputted is less than the amount of coolant being burnt away. This can be caused when coolant production has not been scaled up to match a recent burn rate increase, or when a coolant port has been disconnected or misconfigured.

A reactor in this state will not show any obvious warning beyond a rising temperature reading and decreasing coolant in the tank, so it is worth monitoring temperature directly with a Fission Reactor Logic Adapter rather than assuming the reactor is safe simply because it has not exploded yet.

Excessive Burn Rate

Increasing the burn rate increases steam output, but it also increases coolant demand and waste production at the same time, and all three need to scale together. Raising the burn rate faster than coolant and waste handling can keep up with is one of the most common causes of reactor damage, since the temperature spike happens immediately while pipes, coolant production, and waste storage often take longer to catch up.

It is safer to increase burn rate gradually, checking that the temperature has stabilised at each step, rather than jumping straight to a high rate on a newly built reactor.

Guide

Apotheosis Guide

Covers Apotheosis's enchanting overhaul, affix gear, gems, world tiers, and full control over mob spawners.

Guide

Malum Guide

A guide to Malum's spirit-magic system: harvesting spirits, the Spirit Altar, Soulstained gear, totems, and curios.

Guide

Roost Ultimate Guide

A guide to Roost Ultimate. Guides player's through chicken-based resource farming: Roosts, breeding, training chickens, and full automation.

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