A.

EN : FR

FANC

Our mission

' The AFCN promotes the effective protection of the population, employees and the environment against the danger of ionizing radiation '.

RSS

Sitemap

OK

Radon

Home > Files > Nuclear basic establishments

Info sheet on the reactor and the reactor vessel

Index

Home

Basic nuclear establishments

OSART

INES

Belgoprocess

IRE

SCK-CEN

Target-Tihange

Nuclear stress tests

Medical Applications

Medical & Industrial Plants

Radioactive Waste

Protection of the population, workers and the environment

Security & Transport

Info sheet on the reactor and the reactor vessel

Fourth review meeting of the "Joint Convention on the safety of spent fuel management and on the safety of radioactive waste management"

Reporting Point

EN.S.REG

INES

Situation in the nuclear power station of Destination

There is currently a danger danger?

-3 silent and currently lies the reactor Target was the fuel from the reactor discharge cycles. So there is no danger to the population, workers and the environment.

Moreover, it can count on a strong team of own experts AFCN and works closely with the experts of as always its subsidiary Bel V. the final decision of the AFCN will additionally based on the safety evaluation of the whole file, and on the advice of its Scientific Council and be subject to an international audit.

Back to top

What was the reason for the current checks of the reactor vessel of Goal 3?

To the 12 à 18 months the Belgian nuclear plants be shut down for a short period (average 30-40 days). During this "review period" a portion of the core of the reactor replaced by new nuclear fuel and at the same time the necessary maintenance and control operations can be performed on the installation while it is not in operation.

During the overhaul periods are so-called "operational inspections" carried out in order to verify the good condition of the reactor kuip (mainly in the zones where the welds are between the constituent parts of the bowl). Uses non-destructive ultrasonic measurement techniques (sound waves). These checks shall be carried out according to standards which were developed for metal constructions by the American Society of Mechanical Engineers (known as the standard ASME XI).

The latest revision at Goal 3 has started early June 2012. On the occasion of this planned control measurements were performed on the reactor vessel using a new type of ultrasonic measuring probes. On the basis of these initial measurements, it was considered that additional checks were needed.

Back to top

B/105

How is an inspection of the vessel performed?

The normal checks happen according to the international standard ASME XI, who prescribes a 10-year inspection cycle: over 10 years are all sensitive areas monitored.

Viewed all cracks sensitive zones, nl. where high (mechanical and thermal) avoid tensions that at the base of a crack growth could lie. These are the zones of the welds (e.g. between the rings) and the mouthpieces for the linkage of the pipes of the reactorkoelkring.

Back to top

What is "ASME"?

The American Society of Mechanical Engineers (ASME) is an international organization consisting of thousands of engineers with the intention to cooperate and the technical expertise to share. The activities of this organisation are numerous and cover the field of Mechanical Sciences. ASME is structured in different geographical sections, namely twelve for the United States and abroad, which in itself is further divided into four subsections, one for Europe.

One of the activities of ASME consists in the development of codes and standards regarding mechanical engineering that annually updated.

Part XI of the ASME standards includes the rules for the inspection of the components of operating nuclear power plants.

Back to top

Which bodies carry out the inspection?

The inspection was carried out by the specialized company Intercontrole (belonging to AREVA group), a large number of reactor vessels annually inspects according to the compulsory and additional requirements of the ASME standard and the experience.

In the first place, the inspection was succeeded by an approved inspection body for pressure vessels (Authorized Inspection Agency-AIB Vinçotte International Belgium is the company for this) that agreement must declare with the formulated decisions.

Back to top

What is the role of the AFCN these inspections?

The results of the inspection by the proposed Intercontrole, succeeded by AVI, and then serve to Bel V to the AFCN, which ultimately decides on whether or not to allow the further exploitation.

Back to top

What was there laid down in the additional checks in goal 3?

Error in the end of June were numerous indications of the reactor vessel steel base material, in particular in the bottom ring of the reactor vessel.

The AFCN and Bel V were informed of these auditing results. On 5 July, it was decided to carry out additional checks on the reactor tub of Doel 3 for more information on these results. These additional checks were performed from July 16.

Back to top

What is known about these error indications?

It concerns "laminar" errors. These run parallel with the surface and forms as such, theoretically no risk, because not normally subject to tension.

We remind that the reactor further paralysed as a result of the ongoing revision of Objective 3.

Back to top

How is it that this problem hasn't been said?

A new ultrasonic measuring technique for the first time in June 2012 was applied to the entire surface of the reactor vessel of Objective 3. This audit was conducted by a French company specialised in command of Electrabel. It is the first time that such a service inspection in Belgium in the base material of the reactor vessel is running (outside the zones of the welds). This research is also examined the entire wall of the reactor vessel, while according to the provisions of the applicable ASME XI-standards so far only the sensitive zones were viewed.

Back to top

How is it that this problem has come to light in the stress tests?

The subject of the stress tests was reassessing the robustness of the plants Attn extreme external phenomena such as earthquakes, floods (tsunamis), vliegtuigval, loss of all electrical power supply and the cooling as a result of these phenomena, etc. ... which at the base layers of the events in Fukushima.

The "monitoring the condition of the reactor cockpit", e. d happens according to strict regulatory schemes, provided that be followed to the letter.

Back to top

Are the results of the stress tests still valid after what is now established?

The results of the stress tests are still valid. They had another purpose.

Back to top

When this error indications were present for a long time, they would not have to radioactive emissions may lead?

At this moment the AFCN can confirm that this error indications in the reactor vessel of Objective 3 to no radioactive emissions have led.

Back to top

It Is not desirable for all the Belgian nuclear reactors to a same ultrasonic testing immediately to topics?

A similar ultrasonic control of the reactor vessel of Tihange-2 is equipped during the planned revision of this reactor. This revision starts Middle August. The first results of these checks are expected by the end of september.

Given the recent decision to Tihange-1 ten years to allow additional exploitation, the AFCN has already a similar inspection of the cockpit of this reactor imposed in 2013.

The most recent nuclear power stations, goal 4 and Tihange 3, submit a check according to the AFCN equally to undergo over time.

Similar findings are basically construction-specific. It is also not a aging phenomenon.

Back to top

These findings could have an impact on other nuclear power stations worldwide?

Worldwide there are 21 nuclear reactors of the same type vessels (*number to confirm*). The AFCN consults with the relevant regulators of these countries to give them the necessary information about target to reach out and ask them to 3 also the available experience with them at the disposal of Belgium.

Back to top

Ongoing and planned actions

What actions the AFCN currently?

The AFCN ensures the follow-up of this incident in collaboration with his technical branch, and the company Bel V-AIB-Vinçotte International (AVI) that in Belgium the mandated authorized assessment organisation for such inspections (in service inspections according to the ASME standard).

AFCN and Bel V have several consultation meetings with Electrabel to additional information on this subject had to win.

An independent evaluation of this application is executed by AFCN and Bel V. The AFCN and Bel V also have already contacted foreign nuclear veiligheidsinstantiesoverheden to exchange information and experience.

Back to top

What actions expect the AFCN of the operator?

- Further research of originally construction file of reactor vessel to determine whether it indeed comes to workmanship;
- Metallurgical Research to the cause and to identify any statement (manufacture) errors;
- A full justification dossier must be drawn up in the framework of a restart, which will be submitted to the competent authorities for agreement. This justification dossier will seek to show that the established error indications do not endanger the structural integrity of the reactor vessel.

The revision of Objective 3 is currently in this respect Armistice Day extended until at least 31 August 2012.

Back to top

Is a possible repair of vessel possible?

A possible restoration of the reactor vessel is practically impossible and what the AFCN is also not to be preferred, because it is feared that this probably new internal tensions in the wall of the reactor vessel to avoid is going to occur, what is absolutely.

Back to top

Is a replacement of the reactor vessel possible?

A replacement of the reactor vessel is extremely difficult (high radiation dose, etc ...) and has never occurred in a nuclear power plant worldwide.

Back to top

Technical information

Identity card of the reactor Target 3

- Start of the exploitation: 1982
- NET wattage: 1003 MWe
- Type reactor: pressurized water reactor (PWR)
- Manufacturer: Framatome in association with ACEC and Cockerill (FRAMACECO)
- Reactor vessel forged by Rotterdamsche Droogdok Maatschappij (Netherlands) in the ' 70s

Back to top

What are the different levels of protection of a reactor?

In order to ensure the inclusion of the radioactive material, there are three resistant and leakproof physical barriers placed between the radioactive materials and the environment so that they constitute a triple shielding to the radiation and radioactivity in all circumstances to keep within the installation:

First barrier: the casing of the fuel element

The ceramic fuel tablets, which already holds the largest portion of the radioactive products, sit in a leakproof metal shell.

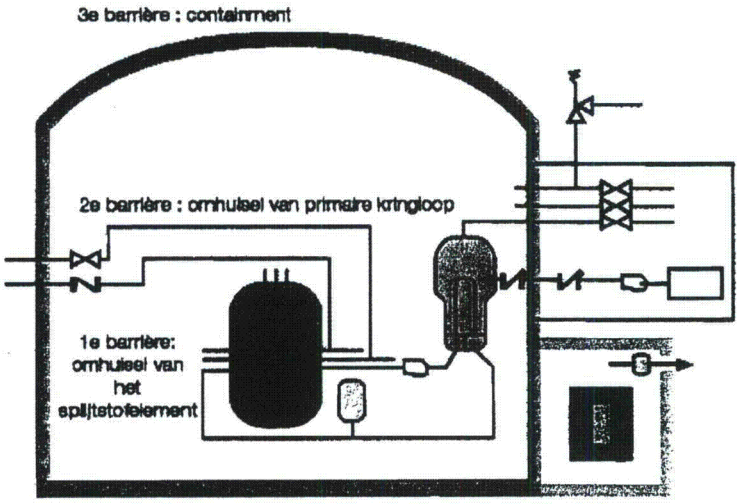
Second barrier: the casing of the primary loop

This is formed by the thick steel casing of the primary cooling circuit of the reactor. The reactor vessel is an essential part of this second barrier.

Third barrier: the containment

The entire primary cycle (as well as other components of the reactor) is surrounded by a very thick concrete structure that can withstand a lot of pressure and against aggressions from outside file.

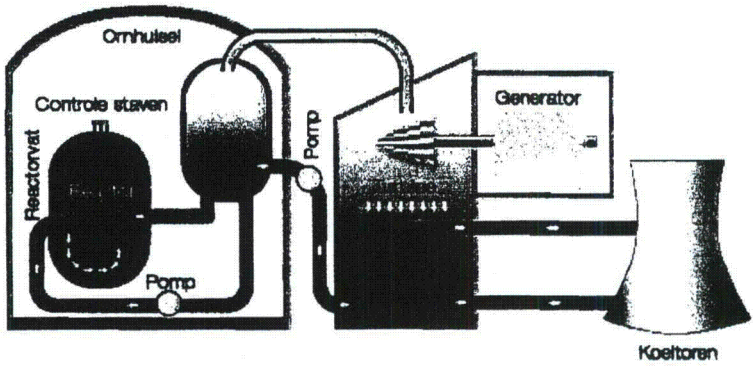
The Belgian nuclear power stations are equipped with a double casing that the primary loop, containing the radioactive fuel, isolates from the outside world.



Back to top

What function has the reactor vessel?

It is in the reactor vessel (reactor vessel) that circulates the water of the primary cooling circuit, through the core, where it is warmed by the hot fuel, after which it issued its heat in the steam generator to the secondary post and return to the reactor. The steam produced is intended for the turbines and for electricity production.



The reactor vessel fulfills a vital role tav the three security features of the reactor:

- Inclusion of the radioactive materials;
- Geometric control of critical Assembly;
- Cooling of the core.

A Back to top

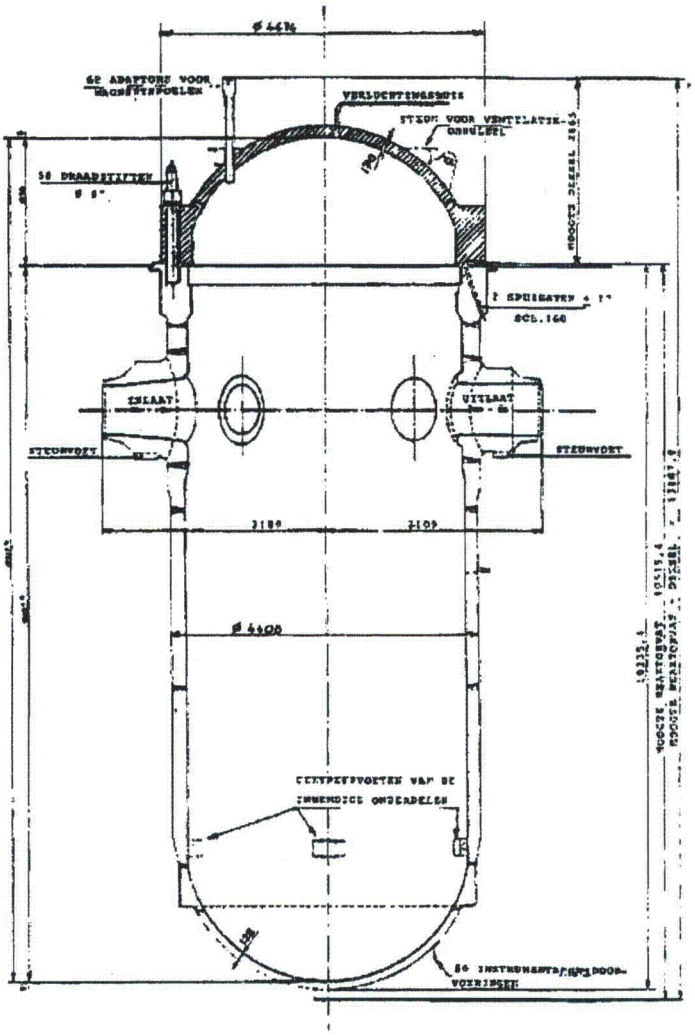
What does a reactor vessel look like?

The barrel of a nuclear reactor looks like a cylinder which is closed with a hemispherical bottom soil. Top is located a removable lid in the form of a spherical Cap. This design achieves access to the Interior of the barrel by removing the lid, after the reactor was shut down. In this way, the fuel elements be replaced.

The lid is held on the barrel through a series of bolts (58 at Target 3) that are bolted in the reactor flange where the support on the top of the reactor flange nuts.

The in-and outflow of the primary water happens via 6 mouthpieces.

The (three) primary loops of the reactorkoelkring are connected to the reactor vessel.

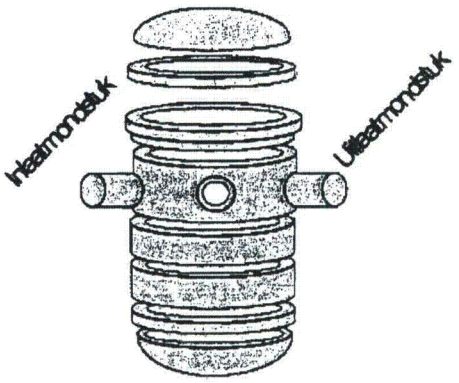


Back to top

How is a reactor vessel manufactured?

The barrel of a nuclear reactor consists of a barrel and a lid. The barrel is about 13 meters in height (including lid) and has an external diameter of 4.4 metres and a total weight of 330 tons (including lid and connection bolts). The wall thickness of the cylindrical part of the barrel is 20 inches.

The barrel consists of forged and machined components from low alloy steel. The main components of the barrel (casings, flanges and mouthpieces) are manufactured by forgings and metallurgical operations. These pieces welded together and be mutually protected against corrosion by means of a thin coating of stainless steel (approximately 7 millimeters thick), which by means of weld on the Interior of the barrel, usually in two layers, is made. The barrel at the end of the manufacturing process is subjected to a pressure test in which it is exposed to a pressure higher than the maximum operating pressure in order to ascertain their resistance. These checks shall be carried out according to the American ASME standards.



Sferische bolkap
Flens van reactordeksel
Flens van reactorvat
Kuipring met mondstukken
Mantelstuk van de kern C1
Mantelstuk van de kern C2
Overgangszone
Onderste bodem of kap

Back to top

Last update

10/08/2012-14: 17

« print friendly« mail a friend « Home