



Photos: Sam Rentmeester

Photomontage of the reactor being built in the 1950's and the reactor in 2013.

50th anniversary of the research reactor

'Nuclear energy was the way of the future'

It was the hidden jewel of TU Delft, according to the employees of the nuclear reactor. Others protested against it and insisted that it be eliminated. Following a major mid-life crisis, the Delft research reactor is now in better shape than ever before.

Jos Wassink

In the summer of 1957, an exhibition entitled 'The Atom' (*Het Atoom*) was held at Schiphol, with a genuine nuclear reactor as a public attraction. For an admission fee of half a guilder, visitors could view the mysterious blue Cherenkov radiation. Throughout the summer, an estimated 750 thousand people did just that. They saw the light of the new era at the bottom of the water basin. Einstein said that those who could apply nuclear energy to peaceful purposes would open the gate to paradise. The Dutch government purchased this key to paradise from the United States, with the intention of housing the reactor in Delft after the exhibition, under the name *Hoger Onderwijs Reactor* (Higher Education Reactor, HOR for short).

First time

25 April 1963 - After a day of opening festivities, peace was restored in the reactor building. After ordering Chinese, a small team led by ir. Hans Kleijn went to work starting the reactor. He proceeded with great caution, as recalled by Professor Emeritus Hugo van Dam. As a student assistant, his assignment was to calculate when the reactor would become critical. Professor Emeritus Marcel de Bruin was also there as a student. He had brought his camera (the only one on site), because he had no official job.

During the night, fuel rods were added to the reactor, one by one. "If you place enough enriched uranium together, the system becomes critical", explains Van Dam, 50 years later. "The chain reaction maintains itself. If the mass is too small, the process will not begin. If the mass is too large, it will get out of hand". Each time the calculations of the student assistants indicated that another rod was needed, the control rods were lowered, nuclear

fission material was added and the control rods were raised cautiously, keeping a firm eye on the measuring instruments. A neutron source was then placed at the core to keep the fission process going. As long as the reactor is not critical, the reaction will be extinguished if there is no external source of neutrons. Once it has become critical, howe-

'There was euphoria in the air'

ver, the process keeps itself going. "Then the source can be removed, and the core will keep simmering quietly", explains Van Dam. That point was reached at four o'clock the next morning. The log reports: "04:00; control rod 49.99%; time-constant positive; reactor is now critical.

"It was up to capacity for only a short time, and then it went out", recalls Brown. Then it was time for a glass of champagne. "I remember that the light had already started to shine through the windows. That was my last snapshot that day".

It was also an unforgettable experience for Van Dam. "You never forget the first time for something like that. Moreover, there was euphoria in the air, because nuclear energy was the way of the future".

"You have visitors"

26 September 1980 - At six o'clock in the morning, the telephone rang in the home of Hugo van Dam, the deputy dean at the Inter-university Reactor Institute (IRI). Because the dean (Prof. Jan Houtman) was unreachable, the police had called Van Dam with the dry announcement, "You have visitors".

"That said enough", Van Dam tells us. The

Anti-Nuclear Movement (*Stop Kernergie*) had already been causing some disturbance, and now hundreds of protesters had infiltrated the reactor site. They had laid planks over the moat and had walked onto the premises. The deputy dean decided to negotiate with them. "Who's in charge here?" he asked. "We're all in charge", came the reply. Van Dam thinks now that it was all purely for show. That aside, he climbed onto a platform and called out three times: "You must vacate the site. Otherwise, we will take action". His announcements were met with jeering laughter.

In conformity with the crisis protocol, Van Dam retreated to an office at the top of the A&E building, which looked out onto the reactor. The Mayor joined the Police Commissioner and representatives from several Ministries.

Meanwhile, the situation was becoming increasingly unpleasant inside the reactor building. Test installations needed attention and liquid nitrogen, and the operators - who should have been relieved at eight o'clock - were becoming restless. It was for this reason that the crisis team decided in afternoon to have the riot police evacuate the site, in the presence of the assembled members of the press.

"That generated bad publicity", recalls Van Dam. The police dragged people away with a new small baton under their chins. In the media, it was soon dubbed the strangling stick. "People perceived it as a harsh evacuation".

Shortage of 'Democracies'

8 June 1977 - Prof. Jan Houtman, an old-school professor who had played a crucial role in the construction of the IRI, resigned as scientific director and declared that the institute was "killing itself with meetings". For >>

'The Oyster programme has returned the ageing reactor to the European research circuit in a revitalised form'

years, the Interim Institute Council (IIR) had been a source of particular irritation to him, as well as to others. In the wake of the University Management Reform Act of 1970, the IIR held regular meetings with the general board, as well as with the TU Delft board, the academic council, the unions and, preferably, with the State Secretary of Education as well. Given that an active democracy demanded everyone to respond to everything, a tsunami of meeting documents was set in motion that led to meetings that would begin at two o'clock in the afternoon and last until after six, sometimes being resumed the next day. Van Dam, who had served in the Navy for two years, was dismayed by this process of 'democratisation': "We almost had more ma-

nagers from outside than we had staff inside. The general board had 26 members. It was horrible". After Houtman resigned, Van Dam served as deputy dean for six months, but he'd already "had it up to here", in his own words. It was not until the arrival of Marcel de Bruin as dean that the institute would once again become manageable. People were also tired of the hassle, says Van Dam. The disadvantages of democracy had come to light: because no one was in charge, unsuccessful projects were dying a very slow death. Examples include the cold neutron source and the pulsed neutron gun. These projects were not progressing at all, but nobody dared to say it. De Bruin brought two special habits with him when he took office as the director in 1988.

Each week, he took a walk through the institute and made small talk with everyone. He occasionally took the time to walk or look out the window and quietly reflect on the future of the institute. The strategist De Bruin kept his eye on the mission of the IRI: the reactor receives its value by sharing the facility with other researchers from a wide range of fields. The manager De Bruin was capable of giving people new ideas and making them think that they had thought them up themselves.

A second youth

1 January 2005 - Prof. Tim van der Hagen took office as the director of a company in transition. Two years earlier, a commission chaired by the current Rector, Prof. Karel Luyben, had assessed the IRI and found it wanting. According to Luyben, the institute was too self-absorbed and too rich. This atmosphere was quite familiar to Van der Hagen. "We simply received money and did our own things". Luyben had proposed splitting the IRI into a facility reactor institute (Delft Reactor Institute or RID) and a department (Radiation Science and Technology)

within the Faculty of Applied Sciences. Van der Hagen was asked to formulate a vision for the future. He did this in close consultation with De Bruin. When this vision fell into favour with the Executive Board, it was followed by an assignment to draft a business plan and, later, by an appointment as the director of an institute in transition. The number of jobs had been cut in half, the quality of the research had to be increased and the institute needed to provide more education. A fortunate turn of events made it possible to attract new people for supervisory research positions: Ekkes Brück, Katia Pappas and Freek Beekman trickled inside. This list should also include Bert Wolterbeek, who was already in service. Meanwhile, Van der Hagen was travelling throughout the country, drawing attention to the RID and its new research focus on energy and health. Money was needed - lots of money. Van der Hagen emphasised that the Delft reactor was the only research facility in the Netherlands producing neutrons. Operating at the international level, however, would require substantial investment. Although

the Ministry of Education had already made a commitment in 2005, the funding for the Optimised Yield for Science, Technology and Education of Radiation (Oyster) programme would not become a reality until 2012.

The future: Oyster

The 117 million euro Oyster programme has returned the ageing Delft reactor to the European research circuit in a revitalised form. This is due to the instruments that are being developed in Delft for high-ranking international facilities, combined with the fact that researchers are able to prepare their experiments in Delft. The director of RID, Prof. Bert Wolterbeek, further emphasises the neutron activation study, in which objects are analysed according to the decay radiation that they emit after intensive neutron irradiation. He also emphasises the production of medical isotopes - research and production of new isotopes, as well as the emergency production as a backup for Petten. The research portfolio of the Oyster programme mentions energy, health, food, chemistry, art history and more. Nuclear energy, for

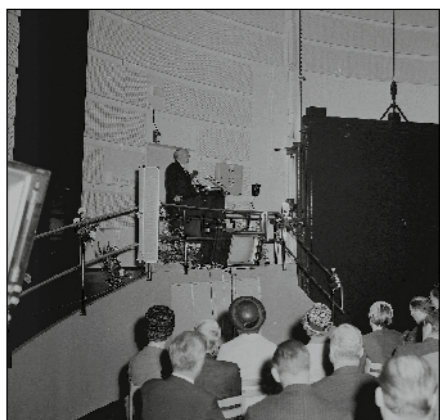


Visitors are shown around at the opening in 1963.

which Einstein had such high expectations, forms only a small part of this portfolio.

See also: *Hugo van Dam and Frida de Jong, Geboeid door straling en strategie. Geschiedenis van het Interfacultair Reactor Instituut te Delft [Fascinated by radiation and strategy: The history of the Inter-faculty Reactor Institute in Delft], Walburg Press, Zutphen, 2003.*

1963



1963, 24 April. Prime Minister De Quay opens the Higher Education Reactor (HOR)

1963



1963, 25 April. Reactor (100kW) critical for the first time

1982



1982, 24 May. Anti-Nuclear Movement protests at the gate

1995



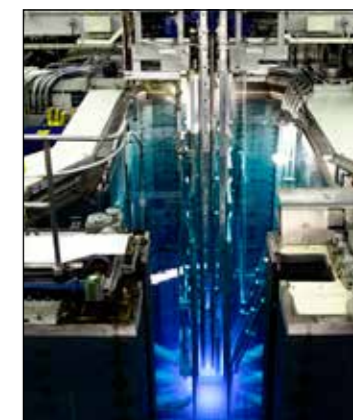
1995, 3 May. Protesting children make a tour of the reactor.

2001

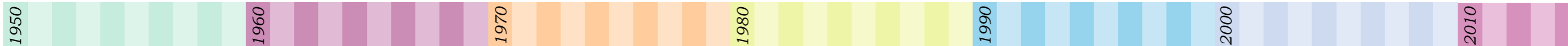


2001, 2 October. Tim van der Hagen drives the first pile for the new office building

2013



2013, 25 April. Higher Education Reactor - 50 years of incident-free operations



1956, 8 May
Prof. Kramers recommends: 100 kW swimming pool reactor at the Delft Institute of Technology
1957, 25 June
Minister issues decree establishing the Delft Reactor Institute
1957, 28 June
Reactor open for public at exhibition entitled 'The Atom' at Schiphol
1958, 11 November
Prof. R. Kroning drives the first pile for the reactor building
1962
Spring storm blows cladding panels from the dome

1963, 24 April
Prime Minister De Quay opens the Higher Education Reactor (HOR)
1963, 25 April
Reactor (100kW) critical for the first time
1965, June
Reactor to 200kW
1966, Sept
Reactor to 500kW
1968
Construction of the cooling tower for expansion to 2MW
1968, June
Opening of 2MW reactor

1969, 13 May
Transition of the RID to the Inter-university Reactor Institute (IRI)
1969
Permit for capacity of 3MW
1979, 28 March
Nuclear accident at Three Mile Island near Harrisburg, Pennsylvania (USA)
1980
Prof. Jan Houtman takes office as Dean
1980, 26 Sept
Reactor is occupied in protest against the new construction
1981, 6 April

Delft Institute of Technology Board rejects relocation of IRI
1981, 29 May
Construction of new control room completed
1982, 24 May
Anti-Nuclear Movement protests at the gate
1986, 26 April
Nuclear disaster at Chernobyl, Ukraine
1987, 16 April
New protest; reactor building covered in graffiti
1987, 1 Sept
IRI returns to TU Delft and is now

'Inter-faculty'
1988, Sept
Prof. Marcel de Bruin becomes Director of the IRI
1995, 3 May
Protesting children make a tour of the reactor
1996, 1 May
Prof. Ad Verkooijen becomes Director of the IRI
1997
IRI receives lower enriched uranium (19.75%)
1998, June
Opening of new experimental hall
2001, Sept

Veltman Commission recommends closing the reactor within four years
2001, 2 Oct
Tim van der Hagen drives the first pile for the new office building
2004, 20 April
Final report of the Luyben Commission concerning the future of the IRI
2004, 23 Nov
Executive Board approves IRI business plan. This plan contains the essential ingredients for the OYSTER programme.
2005, 1 Jan
Prof. Tim van der Hagen becomes Director of the RID

2005, 1 Jan
IRI is split into RID and the Department of RRR in the Faculty of Applied Sciences
2009, 11 May
RID becomes a research partner of the IAEA
2010, 23 Sept
TU Delft/RID announces ability to produce medical isotopes if necessary
2011, 11 Mar
Nuclear disaster in Fukushima, Japan
2011, 22 Mar
Ministry of Economic Affairs requires stress test at TU Delft reactor

2012, 20 Jan
Government allocates 38 million euro to implement the Oyster programme
2012, 12 May
NOS news: Delft reactor suitable for medical isotopes
2012, 30 June
Interim report on stress test: RID reactor is safe
2012, 1 July
Prof. Bert Wolterbeek becomes Director of the RID
2013, 25 Apr
Higher Education Reactor - 50 years of incident-free operations