The Catalyst

Re-use of an offshore oilrig

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#0_Preface

This MSc-dissertation is the result of a fascination for industry and its impact on society.

Industry is something that has inspired me for some time now. Industrial elements have something magical about them: their size, the way the structures are tangled together, the design, the process, the production, the products they create and the image.

These structures are the model of the Industrial Revolution and therefore have grown out to be the building stones for modern society. They have an impact on the lives of millions through their presence in our landscape, the work they provide and by producing billions of products every minute.

We now look at industry not as an enhancement of our society but as a downfall to it. The decaying factories which are no longer in use are being left to become ruins. Creating grey and miserable landscapes in area’s which used to be economically prosperous. They bring environmental hazards, political discussions and costs.

But then imagine that once these factories where welcomed in every town, because they brought change and prosperity.

By re-using industry I want to take away the negative image and despair of it by giving it back to the public in the form of something that brings hope, by giving it a new function which will catalyse the same change and impact industry had on society so many years ago and still has.

As I said before industry has something magical about it, one of the most magical of all in my opinion are oilrigs. These colossus standing in the middle of the ocean, they are bigger than life creating an own world, they are islands of industry.

During a congress about offshore engineering conducting interviews as a part of my methodology of my research process I met Offshore-engineers that were debating the future of these structures. Currently these structures are under a lot of stress. Fossil fuels are getting scarce, wells¹ are drying out and a lot of the structures are no longer feasible.

In the coming ten years, hundreds maybe even thousands of these structures will be taken out of the production process. To grasp the scale: in the North sea alone there are 250 oilrigs. This will create a big economical strain on the oil companies, because of most of these structures where build before 1995² (Brent Spar³) meaning that the costs associated with dismantling have not been included in the

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¹ A well is a hole drilled into the earth or the sea-bed to obtain petroleum.
² “Clean Sea approach” No more dumping permits shall be issued if the installation contains environment hazards or brings damage to the sea. (due to Brent Spar).
³ Brent Spar an oilrig operated by Shell UK was suppose to be disposed in deep Atlantic waters, but due to Greenpeace who organized a worldwide, high-profile media campaign against this plan, by occupying the Brent Spar for more than three weeks they stopped this from happening leading the way to new international legislation.
assessed lifetime costs of the rigs. These facts create a financial gap of billions of dollars.

Oil companies are now working on solutions to (partly) re-use these structures, but they mainly stay in fixed on ideas which are affiliated with energy.

The goal of my project is to create a catalyst by reusing this single oilrig. The intention is to show that these structures can be a challenge to the re-use process, something different maybe even world changing. My hope is that this project will trigger society to think about what can be done with these beautiful structures. So that maybe one day all these old reminiscent structures will be re-used with a new purpose maybe creating whole cities on the ocean……
Currently re-use of industrial structures is a hot topic. Industry all over the world is being recognized as valuable industrial heritage. Because of their size and location in the city they are perfect for dwelling, workspace or cultural projects. A very well known project is The Tate Modern in London, housed in the former Bankside Power Station built in 1947. A few years after it closed it was re-used in a sustainable way by Herzog & de Meuron architects⁴. Since then it has become one of London’s best known and visited attractions.

The sustainable thought is growing amongst the crowd and more and more architects recognize this as a positive thing. People start to rethink how we can re-use the world and rethink design. Al Gore’s⁵ success with his film an inconvenient truth is a typical phenomenon of this development. The world is growing towards a more active approach in sustainability and environmental concerns. Another example of is William McDonough & Michael Braungart with their book Cradle to Cradle⁶, taking it a step further by “Remaking the way we make things”. They started to rethink the cradle to grave theory from the Industrial revolution, and introduced a new theory based on up-cycling rather than recycling. A more tangible illustration of this is 2012 Architects⁷ who complete houses and other shelters by re-using scrap.

This new development in design and particular re-use of old remnant buildings caught my attention. In particular after I had to redesign an old industrial park in Chicago for my Msc2 design project. The project was about how to bring back hope through the use of architecture in a once very viable industrial area. I started to

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⁴ http://www.greatbuildings.com/architects/Herzog_and_de_Meuron.html  
⁵ Albert Arnold “Al” Gore, Jr. (born March 31, 1948) is an American environmental activist who served as the 45th Vice President of the United States from 1993 to 2001 under President Bill Clinton.  
⁶ Cradle to Cradle, William McDonough & Michael Braungart, 2002  
look into the re-design of industrial structures and when I attended a symposium on offshore structures it all fell into place. For my research I interviewed Prof.ir K. Willemse and Prof.ir. J. Meek both Professor in offshore engineering at the TU Delft, who were discussing what to do with the oilrigs ones the wells dry out. This tapped into my imagination. These colossal objects that stand in the middle of the ocean, creating their own world, are islands of industry. These structures are limited in their life span because of the fact that they are approaching an end of an era, cause the oil production in al lot of area’s is coming to a close. What is going to happen with all these offshore structures when the fossil fuels run out? To sketch a framework a lone in the North Sea there are over 250 offshore structures. This could be a big pool of re-usable structures.

The main reason why this subject became an interesting topic was that in 1995 a new law was passed among governments after the big protests concerning the Brent Spar. Which entailed that offshore structures can no longer be sunk to the ocean floor. This created a big economical strain on the oil-companies because the costs for dismantling the structures would run in to Billions of Euro’s, which weren’t pre-calculated.

I started to read about them and found an article by David Flin from the Economist which he wrote in 1995 with the title: “The eternal dilemma; what to do with the disused oilrig”8. This article was based on what ideas the energy world had for these structures. How they were going to be dismantled or how they could be used as bases for offshore windmill parks. So very much within their own comfort zone. Why not totally rethink how to use these colossus? Although re-use of industry is a hot topic in design I couldn’t find anything about this particular part of this that thought outside that box.

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* Economist nr.5 1995, David Flin
After reading his article my mind wondered if these structures could be the base of my final project. The goal of this project is to show that remnant industrial structures can be a challenge, something different, again creating a positive impact on society and maybe even a world changing experience with the help of architecture. These oilrigs meet all the requirements: A grand industrial object which is coming to the end of its life span with immense negativity around it. Could we be able to change this into something of hope? And would it be possible to create more awareness for these structures? So that it can become a catalyst, which generates a tipping point for other people to re-use and rethink these structures? So how can we accomplish the goal?

To explore this I will use the following methodology. I started off by creating a framework through researching oilrigs more in depth; studying literature and cases, interviews with Shell and the department of offshore engineering at the TU Delft, attending lectures/symposia and visiting oilrigs. After having grasped the concept of an offshore oilrig more in depth. I moved on to research Architectural tools, cases and hypothesis which could help me with conveying a message through architecture, coming to an outline for the architectural base of the project. Finally combining these two to create my own hypothesis for creating the catalytic oilrig.
#2_Negativity : despair

As was stated in the first chapter this thesis is based on a fascination with industry and it’s negative image. To sketch a complete picture this first chapter will give some insight to where it all began and how it came to be that the once so powerful image of industry has now changed from a positive to a negative one.

The Industrial Revolution was a period in the late 18th and early 19th centuries when major changes in agriculture, manufacturing, production, and transportation had a profound effect on the socioeconomic and cultural conditions. This revolution started in Britain but soon spread throughout Europe, North America, and eventually the world.

The Industrial Revolution can be seen as the switch from manual to mechanically manufactured goods. It’s start is explained by the discovery of steam educed power instead of water and wind driven machines. Which gave an enormous pulse to the development of the formerly old-fashioned and small-scale workshops to large scale industry.

Due to the increase of production by these larger factories the price of the products tumbled down which then lead to an increase in consumer buying capacity. Which of course lead to more factories and so on. But the industrial revolution brought more than factories and steam power it was also the start of the information age. Developing more schools and programs in which knowledge was exchanged. People gained more awareness and became worldly. Leading up to a more global based society and economy.

People and mostly industry started to rely more and more on energy and especially as the revolution progressed fossil fuels came to play. Oil became a necessity and the oil industry started to expand rapidly. First on land and later on the water. This will be discussed more in dept in the next chapter.

Because of all this new prosperity and work people had a very positive image of industry. As Le Corbusier said: “...Factories, the reassuring first fruits of the new age”. Factories and workshops were welcomed in every town. Which is also seen in the architecture of the factories that time, great pompous buildings in the middle of the city centre. Cases where this is displayed is the Bankside Power Station in London and The Droste Factory in Haarlem. They became icons in the landscape.

They grew to be a part of the new industrial city. These new cities just formed around the factories as if they where the new churches of that time, creating big industrial housing-projects. A typical model for this phenomenon is the works of
Tony Garnier's City Industrielle. In which he describes the new industrial city, where he creates a city divided in different sectors based on the fact that schools and vocational-type schools be near the industries they were related to, so that people could be educated more easily.

Due to this new way of life the age expectancy of people rose and the working-class grew. The onset of the Industrial Revolution marked a major turning point in human society; almost every aspect of daily life was eventually influenced in some way.

This also brought a change in the way people portrayed the world. This even can be seen in the ideas of artistic minds of that time. The way they saw Utopia (which also relates to Tony Garnier’s idea of the industrial city) is a good example of this, because it is always a representation of society and the spirit of time. During this period the criticism on industrialization and capitalism changed from negative to positive. Industry became a vital part of the utopian idea of society. Creating a whole new perspective. That is why Utopian ideas from the 1900’s and later on can be defined as utopia’s of Industry; they recognize the immense power of industry to improve the quality of life and human well-being, and recognized that its spread could not be halted.

They tried to implement industry in the design, way of life and construction of the utopia’s. The influence of the Industrial Revolution and technological progress is for example seen in the work of the Futurists (under Maretti). Who condemned ancient cities and designed an ideal futuristic city based on industry changing constantly. They glorified the era of the machine and technological process. At the end of WOII the ideal image of the new modern city, based on the principle of

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14 Tony Garnier, Cite Industrielle
15 Futurism was an art movement that originated in Italy in the early 20th century. It was largely an Italian phenomenon, though there were parallel movements in Russia, England and elsewhere.
mass-production and industry which offers humans so many advantages, was universally accepted (in the real as well as in the utopian schemes).

But during this process a lot of other things came to light. Most of the factories where based in cities which created a pull towards them. This instant urbanization caused problems with the infrastructure and the living circumstances of the working-class. The housing-projects became too small and the circumstances declined rapidly. This among other things triggered a new movement in the 50’s and 60’s: the image of all this industrial power started to change. People realized that there was an unhealthy working environment, that the factories also brought pollution and that their once beautiful villages started to change in to grey industries dominated cities. This movement can again be traced in the utopian ideals of that time, the Architectural group Superstudio\textsuperscript{16} started to design a new world where all commodities where banned, an anti-futuristic and technological tone was set.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{image.png}
\caption{Picture 4. Futurists & Superstudio}
\end{figure}

This feeling of dislike towards the industrial world grew and is still very much in our minds. We see all the bad things that industry brought us with as a main thing pollution. There are no longer happy and carefree associations with the industrial world. The once so welcome factories have changed into old industrial remnants and are now seen as an eye-sore in the current landscape. We can’t even image that the mass used to believe that they brought any good. The only thing is we still depend on them. But what to do with all this old industrial heritage. How can we again give them a positive impact? Of course by first taking away what makes them negative.

The pollution, economic strain and political discussion. By giving it a new meaning, an image, or function, something to make them have impact on society once again.

\footnote{Superstudio was an architecture firm, founded in 1966 in Florence, Italy by Adolfo Natalini and Cristiano Toraldo di Francia.}
This is now a popular subject. Governments, city-counsels and designers are currently very active with the idea of re-using industrial buildings, simply because they are there and they are a big part of our cultural heritage. Like for example the re-use of the earlier mentioned Bankside PowerStation into the Tate Modern\textsuperscript{17}, now one of London’s biggest attractions. Or North Park\textsuperscript{18} in Germany where an old industrial landscape is turned into a big cultural park. With live entertainment and bicycle and walking programs.

But can we take this a step further, can’t we already start to think what we will do with the industry that is now still active but will be disposed of in the future. And maybe even later before we start about what we will do with it after, Like William McDonough en Michael Braungart state in their book Cradle to Cradle\textsuperscript{19}?

For now we will stick to what we can do with existing industry with a limited life span. One of these Industrial branches which is going to eventually find its way to the scrapheap is the fossil fuel industry. As we all know fossil fuels are running out, and the energy companies are searching for new ways to produce power.

We now know why Industrial objects are preferred in the growing process of re-use and we understand that they ones had a positive impact on society which switched to a negative one. So let’s take it a step further and look at the architectural tools which can help us to turn this around.

\textsuperscript{17} The Tate Modern in London is Britain’s national museum of international modern art and is, with Tate Britain, Tate Liverpool, Tate St Ives, and Tate Online,\textsuperscript{2} part of the group now known simply as Tate.


\textsuperscript{19} Cradle to Cradle, William McDonough & Michael Braungart, 2002
Now that we understand the process of the industrial revolution it is time to focus
on what can be done to create this new positive impact on society by re-using an
offshore oilrig. The ultimate goal of the project is to create a catalyst or a tipping
point which will stimulate other people to rethink/reuse these colossal structures.

What can be done to help make this industrial structure a catalyst? What existing
tools are there in architecture that will create awareness, change and help to
conveying the message?

To come to this point let us first look at what architecture is: “Architecture is an
art-form, which is representative for society and a real and symbolic illustration of
itself.”20 Let’s focus on the word illustration, this suggests that architecture is a
visual art form. Leon Battista Alberti21 already wrote in 1452 that Architecture is
used most prominently to convey a message or meaning to its viewer.22 The primary
information communicated by architecture is generally the building’s function. This
can be seen through a simple example: driving down the street, you see a single
level building with a great quantity of glass along the front, a tile floor, and
permanently placed plastic coated furniture outside, a parking lot out front, even
without the sign you can see you’re driving past a fast food restaurant. A completely
different message is sent by an out-house, barn or a church. We can differentiate
between commercial and residential buildings, industrial and institutional. Yet we
can determine this based solely on the visual perception of the buildings.

Visual perception is key in creating awareness and change. This because it is the
main sense that will trigger your cognition/imagination and it is the most
omnipresent in our current day society. The term ‘cognition’, literally “to know or to
recognize” is used to denote perception, thinking consciousness, and abstract
knowledge.23 In short the process of thought, how our brain interprets the things
we perceive, using experience and predefined elements. It helps us read our
surroundings. By using cognition as a base together with our visual sense we can
play into the human perception leading them in pre-directed ways.

We are living in a society based on the visual sense; we watch television, concerts,
theater, billboards. Almost everything in our daily lives is controlled by vision.

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20 Sesam atlas voor de bouwkunst.
21Leon Battista Alberti (February 18, 1404 – April 20, 1472) was an Italian author, artist, architect, poet, priest,
linguist, philosopher, and cryptographer, and general Renaissance humanist polymath.
22 Re Aedificatoria, Leon Battista Alberti, 1452
A powerful illustration of this is commercials; these little sketches on TV or the billboards around us, they create a trigger (beauty, sale) to make us change our normal pattern, they create interest.

We also can look at architecture as one big billboard, a commercial for itself or the function it is portraying. An example of this is La Chiesa dell'Autostrada; located next to the highway, it was designed especially to appeal to the passing motorist to be seen at 120km/h. But this is not a new development. Robert Venturi\textsuperscript{24} wrote in 1967: “Memorable experiences of architecture break through our consciousness. We identify ourselves with it. The art of architecture brings us together with the world, although the reality of this experience is hard to define. It is our senses and the image we get portrayed which make us aware of what we experience”. The implies that architecture can sent you in a direction, by creating a trigger to our senses, exactly the same thing as commercials do.

Around that same time (1967) the theorist and writer Guy Debord defines this phenomenon as \textit{the spectacle}; “When the real world changes into simple images, simple images become real beings and effective motivations of a hypnotic behavior. The spectacle as a tendency to make \textit{one see the world} by means of various specialized mediations (it can no longer be grasped directly), it naturally finds vision to be the privileged human sense which the sense of touch was for other epochs; the most abstract, the most mystifiable sense corresponds to the generalized abstraction of the present day society.”\textsuperscript{25}

The dictionary describes the spectacle as “something remarkable that can be seen: an object, phenomenon, or event that is witnessed, especially one that is impressive, unusual, or disturbing”.\textsuperscript{26} Currently our whole world is devised by spectacle. Urban sites are lit up by ads on buildings, on high tech billboards, and in the sky, taking the spectacle to new heights. We are constantly experiencing it; it is everywhere, registration stimuli, which this primarily what our visual based society is vulnerable for. The most dominant mode of the society of the spectacle is entertainment, with its codes permeating news and information, politics, education, and everyday life.

\textsuperscript{24} Robert Charles Venturi, Jr. (born June 25, 1925 in Philadelphia) is an award-winning American architect and founding principal of the firm Venturi, Scott Brown and Associates
\textsuperscript{25} Guy Debord, Society of the spectacle; Guy Ernest Debord (December 28, 1931 - November 30, 1994) was a French Marxist theorist, writer, filmmaker, hypergraphist and founding member of the groups Lettrist International and Situationist International (SI).
\textsuperscript{26} Oxford dictionary
The correlative to the spectacle in thus the spectator, the passive viewer and consumer of a social system based on submission and conformity. For me it is a question of how to create awareness with the spectator not leaving him as a passive viewer, but has interaction with the spectacle, he is made part of it. Creating a tipping point for them to get involved. So that the concept of the spectacle involves a distinction between passivity and activity, seeing and interacting, condemning passive consumption of the spectacle so there is room for potential creativity and imagination by the spectator. Creating a stimulating environment instead of a passive one.

Along side this growing idea of the visual based society another architectural movement is born through the group Archigram\textsuperscript{27}. This group set out to start an architectural discussion through imagebased architecture, trying to create a better world. They believed in the fact that architecture could contribute in developing and triggering a socio-economic impulse that would kickstart change. A vivid example is Peter Cook’s\textsuperscript{28} Instant City Airships (1970). It depicts a zeppeling entering a sleepy town, introducing an event leading up to high intensity, a pull towards this town, which creates oppurtunities for local socio-economic developments, after the zeppeling leaves these new developments take over creating a network.

\begin{center}
\includegraphics[width=1\textwidth]{Instant_City_Airships.png}
\end{center}

Picture 5_Peter Cook, Instant City Airships

\textsuperscript{27} See appendix for GS-thesis about this group.
\textsuperscript{28} Sir Peter Cook, (born 1936 in Southend, Essex) is a notable English architect, teacher and writer about architecture, and one of the founders of the Archigram group.
This idea is a typical example of a catalyst, creating a trigger/stimuli which leads to interest/change. But what can this trigger or stimuli be in architecture? The building itself or the function in it? As we look at the picture above it looks very familiar. We all know the story by know: A sleepy, seaside, former industrial city in Northern Spain gets a new museum housed in a building already called--on its completion at the end of the 20th century--the most important building of the 21st. The city, of course, is Bilbao; the museum is architect Frank O. Gehry’s Guggenheim. Virtually overnight, the small city became one of the most popular destinations in Europe. From all reports, Bilbao is rapidly metamorphosing from a sort of one-hit wonder to a genuinely vibrant city with restaurants, nightlife, theatre, and art. Gehry’s radical, shimmering metal building has become a source of immense civic pride. Exactly as Archigram depicted in the 70’s.

But what is this phenomenon? Charles Jencks calls it the Iconic building, others describe it as the WOW-factor.

Jencks defines iconic buildings as delicate balancing acts between what he calls explicit signs and implicit symbols, that is, between an unusual, memorable form and the images it conjures up. He emphasizes that in an increasingly heterogeneous world, multiple and sometimes even enigmatic meanings are precisely what turn a building into a popular icon.

The notion of an icon has traveled far, starting life in the Christian past as an object of religious veneration to now become an object of pull. Icon (Eikon) is literally a likeness, image or similitude. Now we know the icon as an object of recognition for example the little pictograms on your computer desk top. We see them and instantly relate to them, we understand the icon. The philosophical definition states; a sign with some factor in common with the thing it represents. Icon=>meaning now=>can be shrunk to for example a letterhead, it becomes a brand image.

In architecture this is also expressed in another way, it is as old as the pyramids in Egypt. The democratic icon; this is meant to upset the context, overturn convention, challenge hierarchy, get away with the crime, use paranoia=> in order to overcome the existing order. It is build to provoke driven by social forces it demands for instant fame and economic growth, the expressive landmark has challenged the previous tradition of the architectural monument.” It is the economics that drive the icon in architecture today. The I-work works wonders: it sets the market price for landmarks. Like in for example Sydney. The opera house which is now almost like the national symbol of Australia. When it is done successful like in Sydney, it puts architecture on a par with the best contemporary art to explore freely the possibilities of open ended creativity. But when is an icon succesfull? There are ways to distinguish the suggestive creation from the hyperactive outliner a way of judging the icon according to Charles Jecks.

29 Bilbao, is the largest city in the Basque Country in northern Spain and the capital of the province of Biscay.
30 The Iconic Building, Charles Jencks, 2005
He depicts three means of judging if we are dealing with an icon:

1. Enigmatic Signifiers (support the deeper meaning of the building)
2. Negotiation between the explicit sign and implicit symbol
3. Looking for its limit in reach.

These three can help us to define a iconic building. Making it a bit less complex we are on the one hand looking for a building that must provide a new and condensed image, be high in figural shape or gestalt, and stand out from the city. On the other hand, to become powerful it must be reminiscent in some ways of unlikely but important metaphors can be a symbol fit to be worshipped (a hard task in a secular society).

To get to a guideline of how to create a successful icon, we’ll look a bit closer to 5 of these buildings (recognized by the three previously mentioned boundaries). In the following pictures are some examples given of Enigmatic Signifiers and their negotiation between the explicit sign of symbol.


![Chapel of Notre Dame du Haut](image1)

2. **Atomium, André Waterkeyn, 1958**

![Atomium](image2)
3. Sydney Opera House, Jørn Utzon, 1973


5. Swiss Headquarters, Norman Foster, 2004

As we look at these examples we can see that they have a few things in-common. They are easily recognized, because of their particular shape or form. As is shown in drawings next to the pictures of the buildings, imagination is a big part of the iconic building. The icon or meaning is in the eye of the beholder. There is not just one image that is portrayed there are multiple. Which makes it even more interesting and a point of discussion among the public.
These buildings stand out in their landscape or urban environment. They all have important function within the landscape, a church, a museum, an opera house, or headquarters. Because of their function and expressiveness the buildings form a statement/icon, this connects them to the event, which provides a relationship between the outer and the inner world. The buildings attract tourists, pilgrims and the locals, bringing them all together generating a network, opening up opportunities for commercial en cultural venues. The thing about the iconic building is just as the icons on your computer desktop that you start to become familiar with them and affiliate them with certain ideas or events. This is what makes them so powerful in our current society.

We can distract certain powerful qualities of a successful icon from these assumptions. Which will create a boundary for the design of a successful iconic building.

It has to have:

- Permanence (as an icon/ in existence)
- Connection to the event ‘Relationship between inside and outside’
- Expressiveness
- Creating a relationship to local realities=>network
- Prominent building or important function

To summarize; just what is it that the successful icon is doing? At a minimum, with its sensuous materials and mixed metaphors, it is heightening experience. Beyond this it is playing on positive natural overtones and paranoid comparisons- both codes of natural creation (animal and vegetable) and destruction (explosion and deformation). The ultimate meaning of the iconic building may be partially open but it is consistent enough to provoke the pilgrim, or tourist, to try to decipher the icons. The successful building is, in effect, an giant iconostasis asking to be decoded, which is why people come back again and again to try to phantom the meaning. It can like in Bilbao or Sydney (Opera house) become a catalyst of change, creating better socio-economic conditions, archi-tourism, networks, education and awareness.

To put this theory together with the spectacle and visual sense we can sketch a diagram of how a catalyst can be created through architecture, which will be the basics of my design project.
Let’s walk through it; How can we create a catalyst? At the beginning of this chapter it’s explained that vision is nowadays our most powerful sense. Through a visual stimuli we get triggered (curious) to follow a certain path. In this case the stimuli will be the Spectacle and Icon. These two will trigger interest through their presence and visually attraction. Which then will lead to interest or change in pattern. This is the first step to creating a network, socio-economic change, awareness, tourism, recognition and a happier environment. Just like the Archigram drawing in the beginning of the chapter.
#4 Introducing the oilrig

Before we can totally grasp the concept of the project and go and apply the theory to the project it is useful to understand a bit more about the oilrigs, what an oilrig is and what types can be found. This chapter will explore offshore structures from the beginning until the end.

We will start with the fundamentals: What is an offshore oilrig? The definition of offshore structures as stated in the Handbook for offshore engineering is the following: "An offshore structure has no fixed access to dry land and may be required to stay in position in all weather conditions. They may be fixed to the seabed or may be floating".31

Offshore exploration dates back to the beginning of the nineteenth century. The first offshore oil platform in the world is the Oil rocks in Baku, Azerbaijan in the Caspian Sea. The oil-wells were drilled from extended piers into the water. A unique feature of the Oil Rocks is that it is a fully functional city with over 200 km of streets and a population of about 5000.

Picture 6 Oilrigs Baku

However, the birth of the offshore industry is commonly considered as in 1947 when Kerr-McGee completed the first successful offshore well in the open waters in the Gulf of Mexico. The drills, drawn works and accommodation were supported by a wooden decked platform built on piles driven in to the seabed. They were in water depths of up to 100 m. These structures were the fore-runners for the massive platforms that now exist. Since 1947, more than 10,000 offshore platforms of various types and sizes have been in constructed and installed worldwide.

31 Handbook of offshore engineering, edited by Subrata Chakrabati
In 1975 the first floating structure was released on the water. This made it possible to drill on oil-reservoirs that were even deeper situated. Although nearly all of the platforms are of steel construction, around two dozen large concrete structures have been installed in the 1980/90’s.

Now offshore exploration has become one of the largest industries of the world, with thousands of structures placed worldwide.
4.1 _Types of offshore structures_

An offshore structure exists of two main parts; the _topside_, which is the upper part of the platform that accommodates the facilities and the _sub-structure_ which forms the foundation of the platform.

The structural design of the offshore structure is distinct based on the type of the sub-structure, rather than its function. The functional requirements for an offshore facility are primarily determined by the following variables; oil/gas reservoir and fluid characteristics and ocean environment. These factors primarily influence the size and the configuration of the platform. In this chapter all the different types will be discussed from bottom to top.

Picture 7 _Types of offshore structures_
4.1_ Sub-structure

Offshore sub-structures may be defined as either floating or bottom supported by the ocean floor. This creates the main split between the types.

4.1.1_Bottom-supported structures

Bottom-founded structures are generally constructed from welded steel tubular members, comparable with a large space frame. This frame acts as a truss system supporting the weight of the structure and the environmental forces from waves, wind and current.

This space frame is fixed directly to the sea bed by weight, piles and or guidelines, so as the name already predicts the bottom-supported structures get their stability and strength from the seafloor.

In the diagram below shows the different categories in bottom-founded structures. These categories will be addressed separately further on in the thesis.

Bottom-founded structures can be divided into two main groups: Fixed platforms and Compliant platforms. Fixed platforms behave as a rigid body and have to resist the full dynamic forces of the environment. Such platforms are because of their immobile nature designed for long term use.

Fixed platforms are economically feasible for installation in water depths up to 520 m.

The two main platform categories for the fixed structure are the Jacket and the Gravity base structure. From these two the Jacket based structure is the most common offshore structure. It has a three-dimensional space frame and an enclosure for the employees (that is the reason why it is called a jacket). It typically supports a superstructure having 2 to 3 decks and can carry over 10,000 tons.

Gravity base structures are placed on the seabed and held in place by their weight, there is typically no use of anchors or piles. Because of this it is usually placed in sheltered waters near the coast.
Compliant bottom founded structures are usually designed so they deflect, but still the impact of the dynamic loads is greatly reduced. In this category again there are two main types; the Compliant and the Guyed tower.

The Compliant tower consists of narrow, flexible towers and a piled foundation. It is fairly transparent to waves, because it is designed to flex with the forces of nature.

The Guyed tower is a slender structure made up of truss members, which rest on the seabed and are held in place by guy lines\textsuperscript{32}. It works well in a hostile environment.

4.1.2_ Floating structures

Floating structures are compliant by nature, but come in various degrees. Neutrally buoyant\textsuperscript{33} structures are dynamically unrestrained and are allowed to have six degrees of freedom. Positively buoyant structures are tethered to the seabed and are heave-restrained.

The size of a floating structure is determined by considerations of buoyancy and stability. Another critical issue is the weight of the topside, which is in cohesion with the stability. The construction of a floating structure typically consists of stiffened plate panels, which make up a displacement body.

In the diagram below shows the different categories in Floating structures. These categories will be addressed separately further on in the thesis.

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\textsuperscript{32} Guy lines/tendons/tethers are tension cables which hold the platform in place by fixing it to the seabed and providing stability or counter force against the environmental forces.
From the three types of Neutrally Buoyant structures but I will only discuss two because FPSO is a shipstructure.

The Semi-submergible platform is a multi-legged floating structure with a large deck. The legs are interconnected with the pontoons. These pontoons can be flooded with water so it will submerge to the preferred depth. Although it’s buoyant it sits low with a large part of the structure under water. This makes it a very stable installation. A big asset is also that the structure is easy to move either by their own power or by being towed by tugboats.

The other type is the Spar. This is a large deep draft, cylindrical shaped floating structure. Generally it is anchored to the seafloor with multiple mooring lines. Because of the length of a Spar (and how it sits in the water), the hull\textsuperscript{34} can’t be towed upright. This makes it harder to reposition a Spar in an easy way as a Semi-submergible can.

The Positively Buoyant structures exist only of one type.

The TLP, Tension Leg Platform, a floating structure which has vertical tendons which restrain the relative motion between the risers\textsuperscript{35} and the hull, which allows it to be installed in extreme weather conditions. The structure can be towed upright.

\textsuperscript{34} Hull is the frame or body of an offshore structure.

\textsuperscript{35} Risers is a pipe leading fluids upwards from the ground or sea-bed level
4.2 Topsides

The topside is the part of the platform which hosts the function of the offshore facility. It is the top part of the platform and is usually a separate element which is placed on a substructure (as discussed above).

There are five main categories:

**Exploratory Drilling Structure**, is a structure with limited motion, it can mostly be found on a semi-submersible substructure. It accommodates highly variable deck loads, so it is easy to change the configuration of the platform.

**Production Structures**, again a stable structure with limited motion. Its configuration is dependent on the location and the reservoir, it will stay on station during its lifetime (20-30 years). The structure can be found on Fixed, Compliant and Floating substructures.

**Storage Structures**, as the name already predicts it hosts a temporarily storage facility on site before transportation. Cargo and ballast management is really important. It can be found on Spars and Ship-shaped FPSO’s.

**Export Systems**, facilitate the transportation from oil and gas from site to shore. Structures take the shape of floating buoys. But usually tankers are used for this system.

**Flotel**, a structure that is used to provide another platform, which is generally attached by a gangway, extra accommodation, catering and the usual leisure facilities. Typically a converted semi-submersible is used for this purpose.
4.3 Decommissioning process

When an offshore structure comes to the end of its lifespan it has to be decommissioned. This entails planning, gaining approval for and implementing the removal, disposal or re-use of an offshore installation.

There has been a great deal of debate over the fate of oil and gas platforms that are decommissioned as a result of declining production or changes in strategy. There is a growing realization that decommissioning is not just a technical, environmental or navigation issue: safety, economic and social implications also have to be considered.

As I mentioned before, in the preface, since 1995-1998 a new set of regulations has been implemented. At this moment all installations have to be integrally removed and all steel platforms installed as from 1999 have to be totally removed.

This of course creates a big task for the offshore industry. The expectations are that in the coming 5 years at least 850 offshore structures will have to be decommissioned.\textsuperscript{36} Estimates of the likely cost of decommissioning the disused platforms in for example the North Sea are rising sharply, with current estimates ranging to over 22 billion euro's.\textsuperscript{37}

The following diagram shows the different decommissioning options.

![Decommissioning Diagram](image_url)

\textsuperscript{36} TU Delft
\textsuperscript{37} Energy focus oil & gas, by David Flin
Not only the cost of decommissioning is a problem. Also the way of proceeding with it. The offshore sector is now constantly searching for new ways to remove offshore facilities\(^{38}\), clean-up and re-use them. One of the new developments in this field is the re-use of the platforms as windfarms.

This is where the project steps in. In the decommissioning diagram is shown how the substructure and topside are dismantelled. To re-use the structure for a new purpose a part of the topside will have to be taken of and sent to shore. This is because it is the factory part of the structure which can’t be reused in it’s whole. Parts of it will be taken to shore to be dismantelled, cleaned up and reused. The substructure will be totally reused in the project together with some remnants of the topside.
4.4 Chosen Platform

The choice of the structure to use for the project is a combination of technical and esthetical aspects:

- Size
- Maneuverability
- Material
- Offer
- Set-up/Configuration

The size of the structure is one of the main focal points concerning choice of the platform. Most of the structures are immense and to form an example and a tangible project the platform can’t be too large. Because of the fact that the goal of the project is to reach as many people as possible it would be an asset to have a movable of towable structure. So it can travel around the world.

The material of which the oilrig is made is essential to the selection process because it will form the base of the new platform. The new structure will have to be attached to the old one, preferably in a fairly easy way. This is why steel will be the material of choice over concrete because of the welding possibilities.

Offer and configuration are part of the last element in the process this because after the decision for a steel platform that is relatively movable the offer in platforms and their configuration comes to play. As we read before certain platforms have different topsides which create the total package of the rig.

Picture 8: Semisub mergible with exploratory drillingsystem.
Taking in account all the previous information. With as the main subject how we can create a catalyst. The basis of the project will be a Semi-submergible with an exploratory drilling-system. This particular form of oilrig has the size of roughly 60 by 100 meters and is fairly small for a full size rig.

Keeping the catalyst in mind this is a fair size to build a structure on that is one of a kind, with a suiting function. It has to be able to be grasped in one single look.

Another interesting feature is that this particular type of offshore structure can move fairly easy creating a more global approach and thus a bigger reach of the catalyst. The rig can be towed by a tugboat or completely on its own driven by 4 screw-engines based on the bottom of the rig, moving with a speed of approximately 45km/h. As I explained earlier a certain substructure comes with a topside the two most common ones on a semi-submergible are the exploratory drilling system and the production structure. My choice fell on the exploratory drilling system, because this makes the structure of the rig used to highly variable deck loads, so it is easy to modify the configuration of the platform, and it is easily adapted to change. Which makes it suited for all different kinds of functions. The last put definitely one of the most important aspects is that the rig has a very limited dept to it. It can go to places where there is as less as 9 m from the ocean floor to the water level. Which means that it can come very close to shore and can be docked in most of the big havens in the world.
This chapter will focus on how we can combine the theoretical model with the oilrig so we can produce a catalyst. One that can bring hope and new insight in to the re-use process.

But before we can start to develop this catalyst we first have to take away the basics of the negativity that surrounds the oilrig. As Charles Jencks said: In any new movement, by definition, the pre-existing relations have to be destroyed. The basis of the negative image of the oilrig is the oil industry and the pollution it brings. By giving the rig a new function outside of the oil industry’s safe zone and thus taking away the pollutant part of the rig this will be mended. The contaminated parts of the rig will be taken to shore to be cleaned up and re-used, the rest of the rig will be sent to a harbor to get its transformation.

To use the principle of Iconic building for creation of the catalyst in the project, the function of the structure has to be a prominent one, preferably one that connects to the event, and thus the oilrig. Because of the sustainable character of the project and the expressiveness that is needed I chose Greenpeace as the partner for this catalyst. They were of course the ones that started the “war” against the oilrig with their protest against the Brent Spar. Which lead to the development of new rules for the decommissioning of offshore structures. Who better than them to give the right example.

### Greenpeace

In 1971, motivated by their vision of a green and peaceful world, a small team of activists set sail from Vancouver, Canada, in an old fishing boat. These activists, the founders of Greenpeace, believed a few individuals could make a difference.

Now Greenpeace is a global campaigning organization that acts to change attitudes and behavior, to protect and conserve the environment and to promote peace by:

- **Catalyzing an energy revolution** to address the number one threat facing our planet: climate change.
- **Defending our oceans** by challenging wasteful and destructive fishing, and creating a global network of marine reserves.
- **Protecting the world’s remaining ancient forests** and the animal, plants and people that depend on them.
- **Working for disarmament and peace** by reducing dependence on finite resources and calling for the elimination of all nuclear weapons.
- **Creating a toxic free future** with safer alternatives to hazardous chemicals in today’s products and manufacturing.
- **Supporting sustainable agriculture** by encouraging socially and ecologically responsible farming practices.

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39 Charles Jencks; Charles Jencks (born 1939) is an American architectural theorist, landscape architect and designer.
And with this collaboration between the rig and Greenpeace they will both benefit from the catalytic factor. Greenpeace will get world wide exposure because of the icon and the movable factor of the rig, one central focal point (instead of all the single oriented offices that are spread out across the world), they get the opportunity to do research all over the world, a place for their ships to restock and the chance to educate people while it is doing its work as a catalyst for the offshore oilrigs. The offshore oilrigs will on the other hand benefit from the sustainable name of Greenpeace taking them even further away from their old negative association.

The catalyst will do is work in three different types:

1. **Shore location;** The rig is near the shore, in a harbor or on the coastal side. This is where it has a archi-touristic and educational function. The rig will attract people by its presence because of the spectacle and iconic image. Which will create archi-tourisic attraction people can visit the rig and learn more about it they can even spend the night in the hotel. It also will entail a exhibitional function for Greenpeace to educate people about sustainability and the work they do. Because of the natural pull towards the rig the city where it is situated will get the opportunity to create a network, rejuvenating socio-economic conditions, and generally just benefit from the presence of the structure.

2. **During Transit;** This is when the complex will expose its iconic function at its best. During its tours across the global waters it will be a traveling icon. People can notice it from the shore because it will be visible from a far distance, it will trigger them to think about what Greenpeace is doing. Questions will rise; Maybe there is a environmental emergency?, Where are they going? Are they trying to save the whales? Are they researching global warming? And so on. Hopefully pushing them to research Greenpeace or the oilrig more in-depth, for example on the website where they can be tracked.

3. **Sea location;** This is when the island is situated on the ocean in a specific location. It now becomes a beacon. It can do research the Greenpeace ships can join the rig and get restocked or repaired or can be briefed for their new assignment. It can also act as a congress centre where for example world leaders can discuss the melting of the pole’s on location, so they can see with their own eyes (vision is of course still the most dominant sense :).

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40 [http://www.greenpeace.org/international](http://www.greenpeace.org/international)
By using these three different stages the rig will become a catalyst, bringing hope, creating a network and improving socio-economic conditions in the cities that welcome it. Educating people and giving them awareness about what can be done with these magnificent structures stimulating them to think about these redundant oilrigs. And finalizing my hypothesis as shown in the diagram below.

Creating stimuli to let the crowds imagination flow and pushing them towards starting new projects, like dwellings, on oilrigs, prisons or maybe even airports. Let’s hope this catalyst will create a demand to do what Architectural theorist Franco Borsi said; “the time is possibly approaching when there will be a demand in society for floating factories to go along with floating cities”. And then maybe in a few years will have whole networks of re-used industrial structures across our global waters.
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