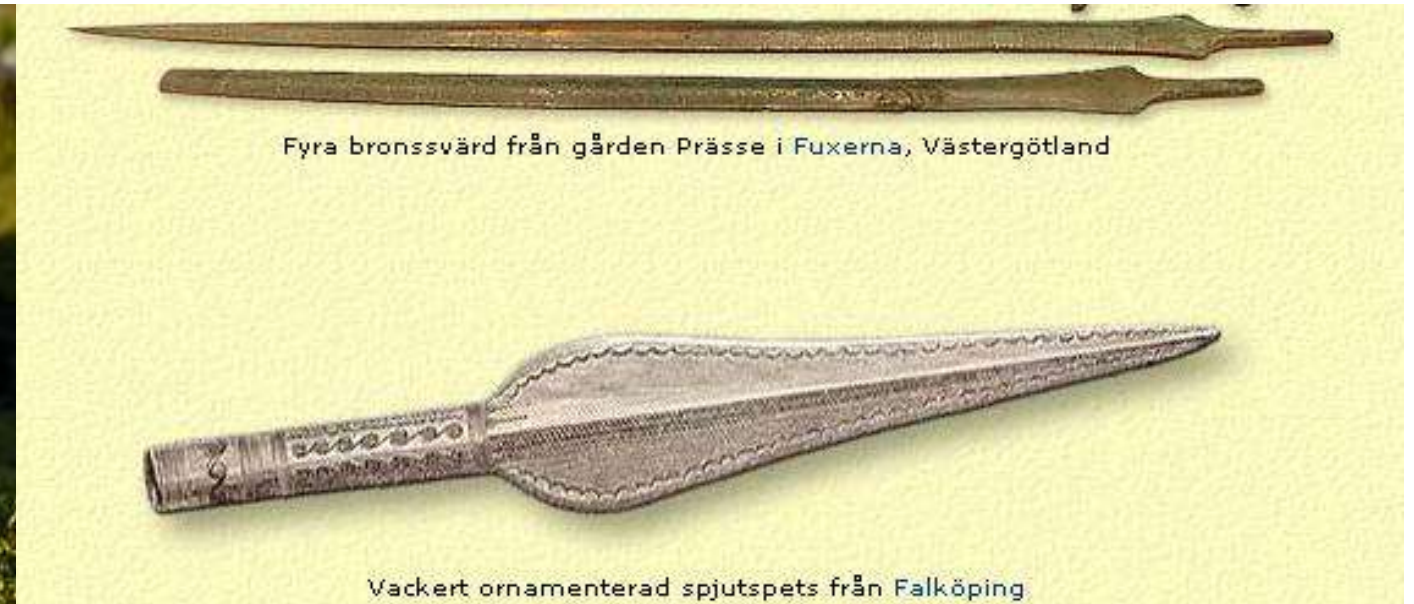


Sustainability & life-cycle cost advantage with stainless steel

Deepak Vaidya
Outokumpu India

2nd April, 2016

Civilization is a Good teacher



The different epochs were named after the material that was used at time



Stone Age
200000 B.C

Bronze Age
3500 B.C

Different epochs in the history of humans



But why change material from Bronze to Iron when Bronze had good enough properties for weapon and hunting?

- Lack of raw material
- Properties were not good enough for axes, plows and saws.

A revolution was needed!!

Iron Age

500 B.C

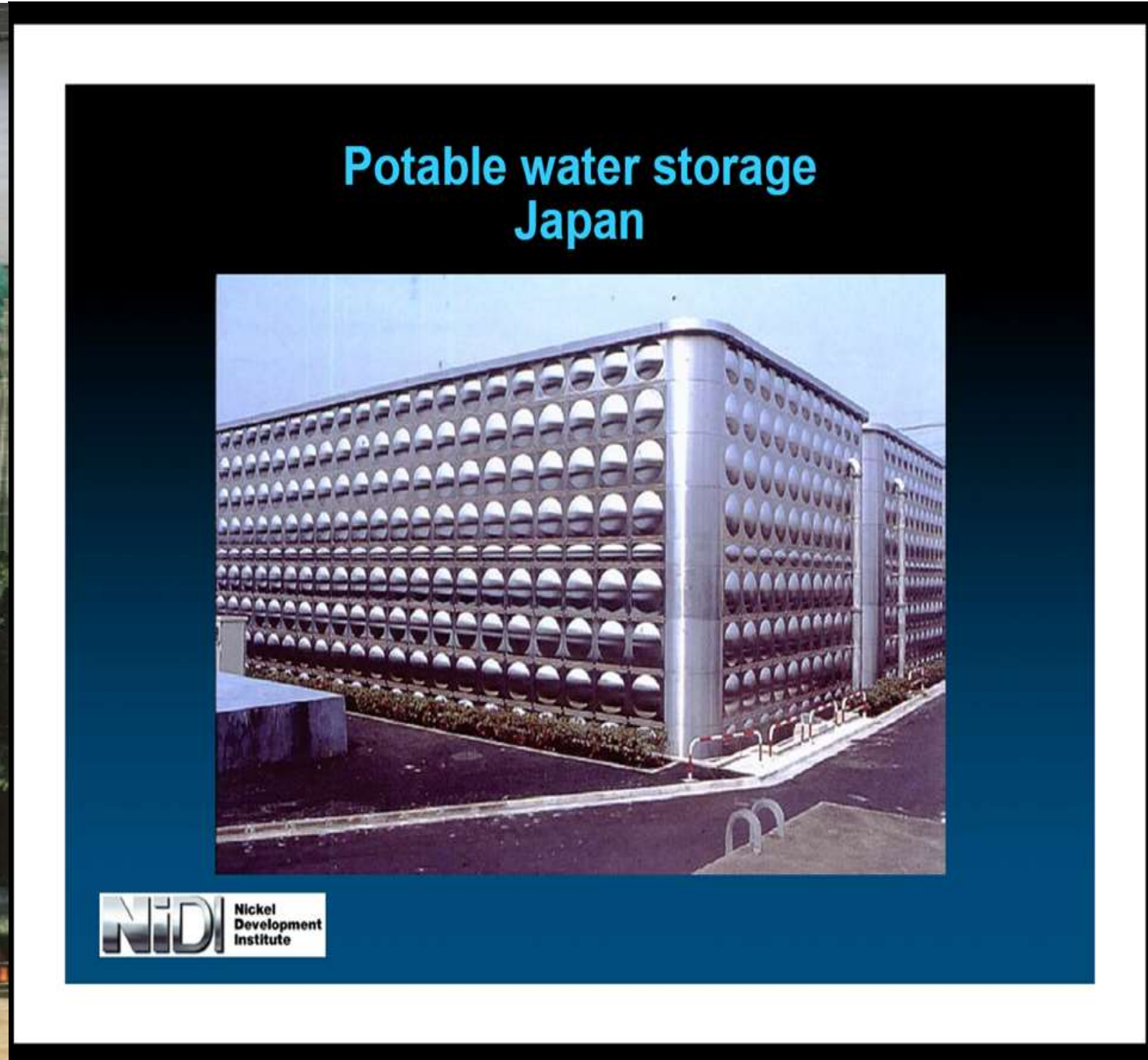
What is next epoch?

India : Where are we heading?

- Building Infrastructure
- Energy for All – the biggest challenge
- Self–Sufficiency in Food Products but Storage and Rotting an issue
- Ensuring PURA vision : Providing Urban facilities in Rural Areas
- Consumers demanding for Aesthetic and Easy to Maintain products with low life cycle cost
- Value Added Products manufactured locally

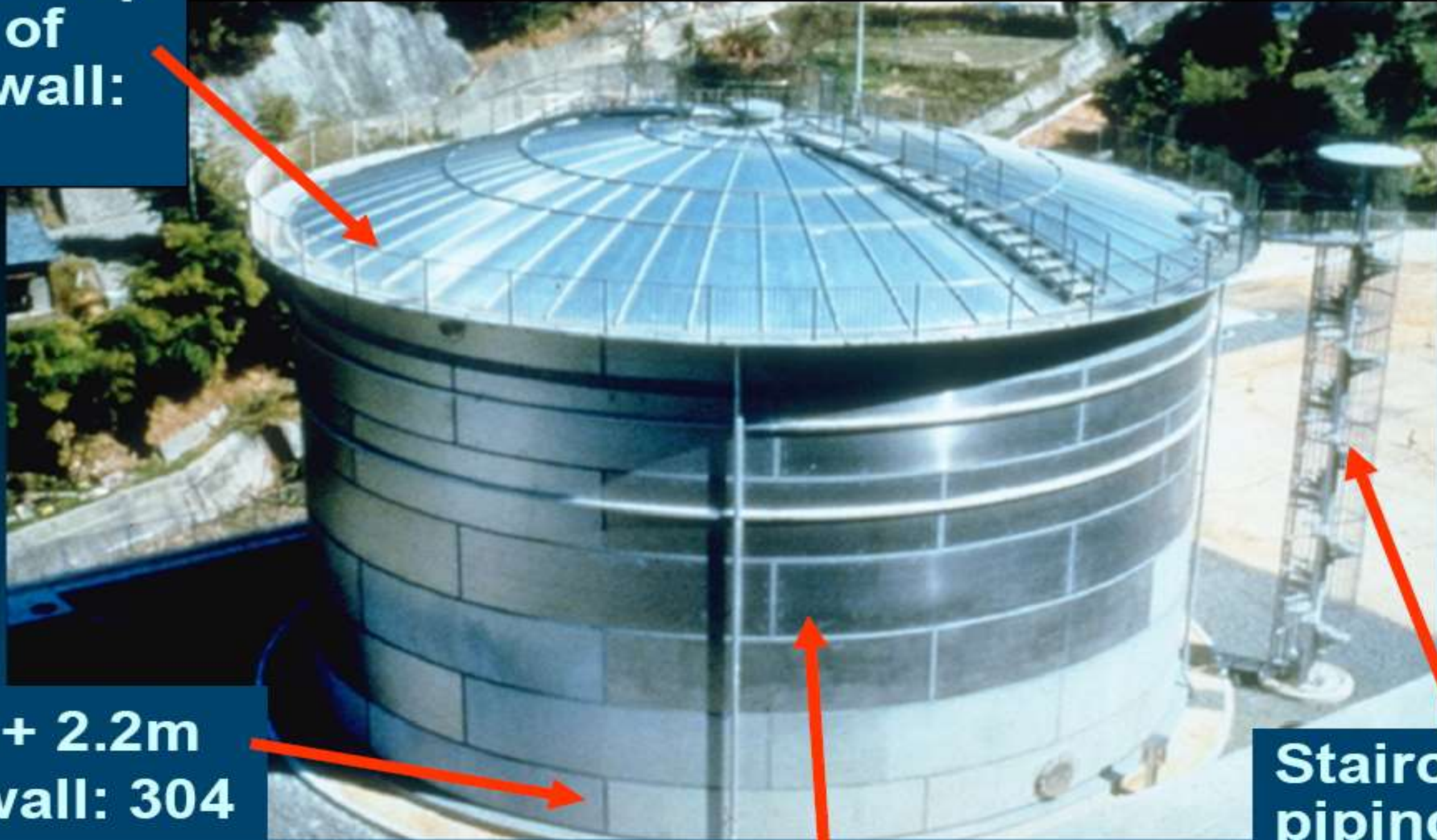
- What we need ?
 - The Engineering fraternity needs to seek products according to the International Standards
 - Preserving Nature, Environment & Role of Green Materials in preserving Ecosystems must not be ignored
 - We must have an open mind to accept new products and applications so that the effect on the environment could be minimized and we build a **Sustainable India**.

CLEAN WATER – OUR RIGHT



Municipal water storage tank – Matsuyama, Japan

Roof + top
7.5m of
side wall:
2205



Floor + 2.2m
side wall: 304

Staircase,
piping and
ancillaries:
304

4m intermediate
side wall: 316



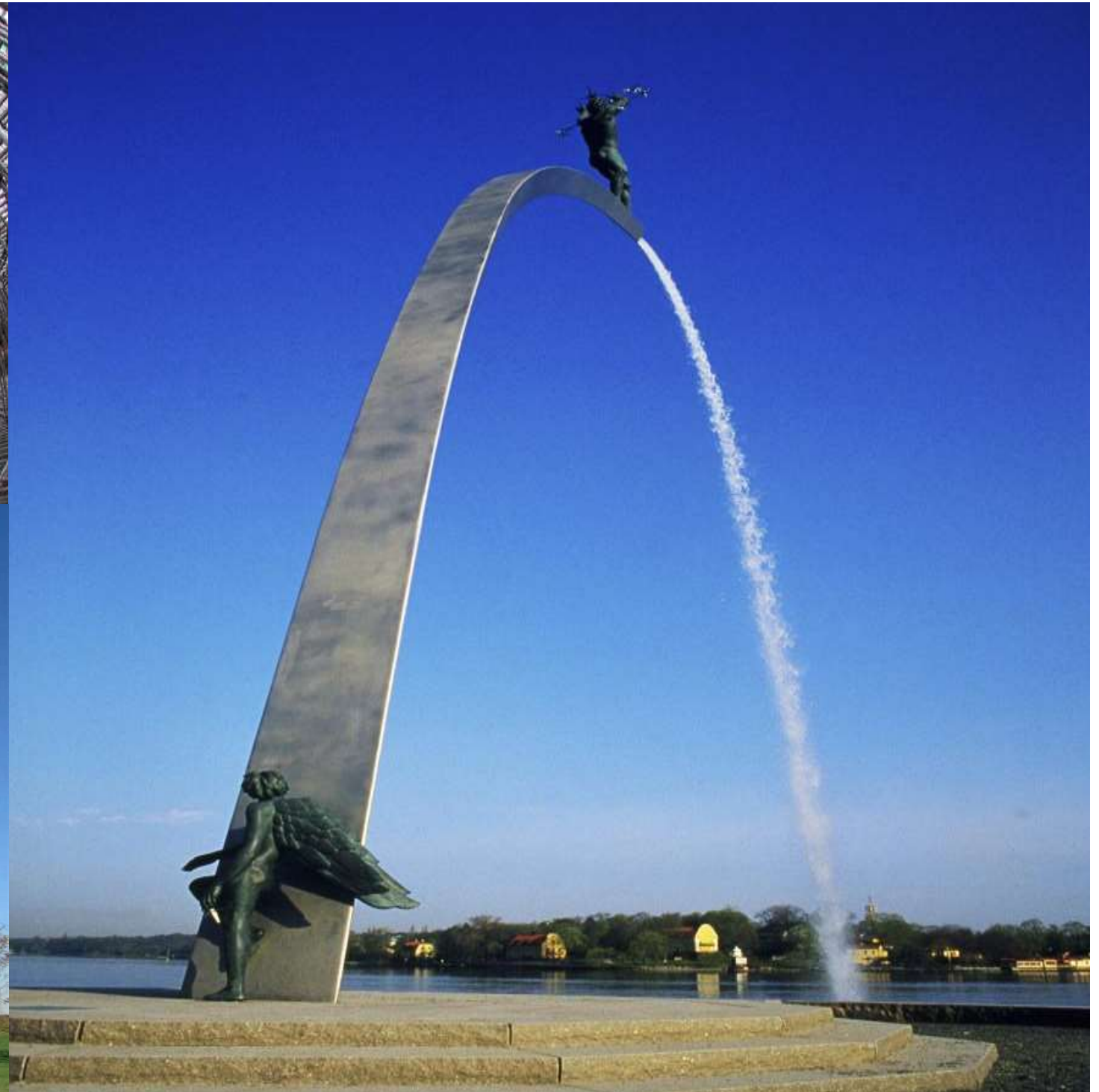
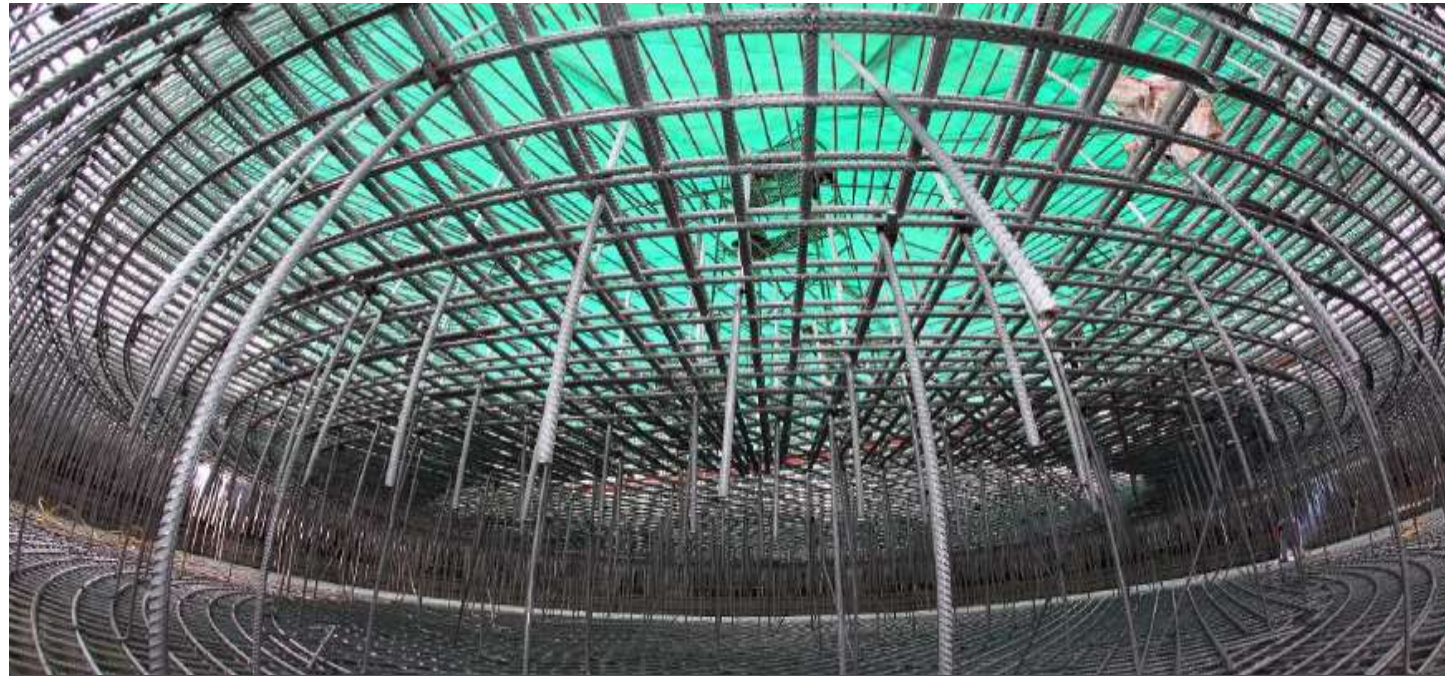


OUTOKUMPU
is Committed to the environment

This is not INDIA of our dreams




Heritage : more than 1000 years of life



Food .. Let us stop rotting it







Advanced materials

Hygienic material

Chalvignac wine tanks in France

Advanced materials

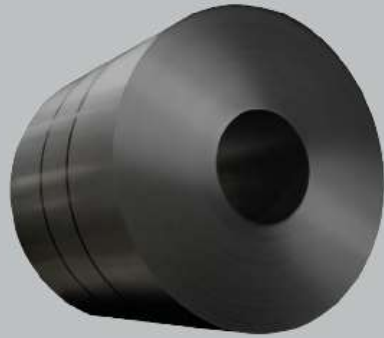
Hygienic material

outokumpu

stainless steel & high performance alloys



Stainless Product Forms



Hot rolled
black strip



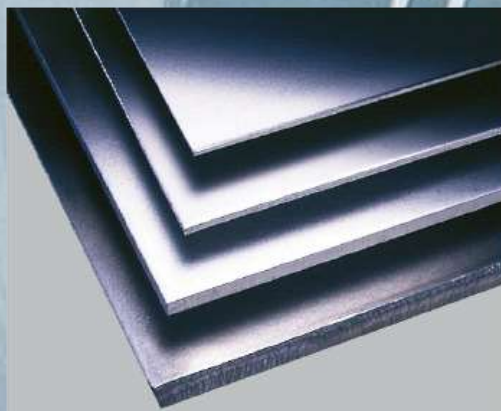
Hot rolled
white strip



Cold rolled strip



Precision strip



Quarto plate



Tubes



Wire



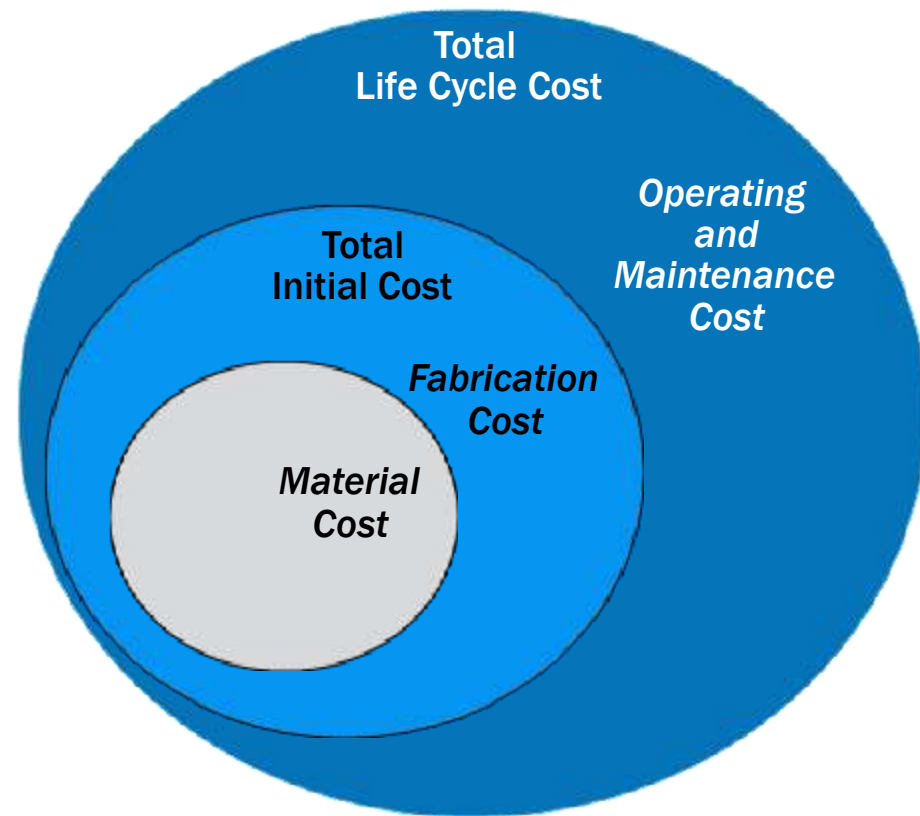
Long products Semi
finished (Bar & Rod)

Stainless surface finishes

outokumpu
stainless steel & high performance alloys



Thorough LCC analysis with customer



Total initial investment cost

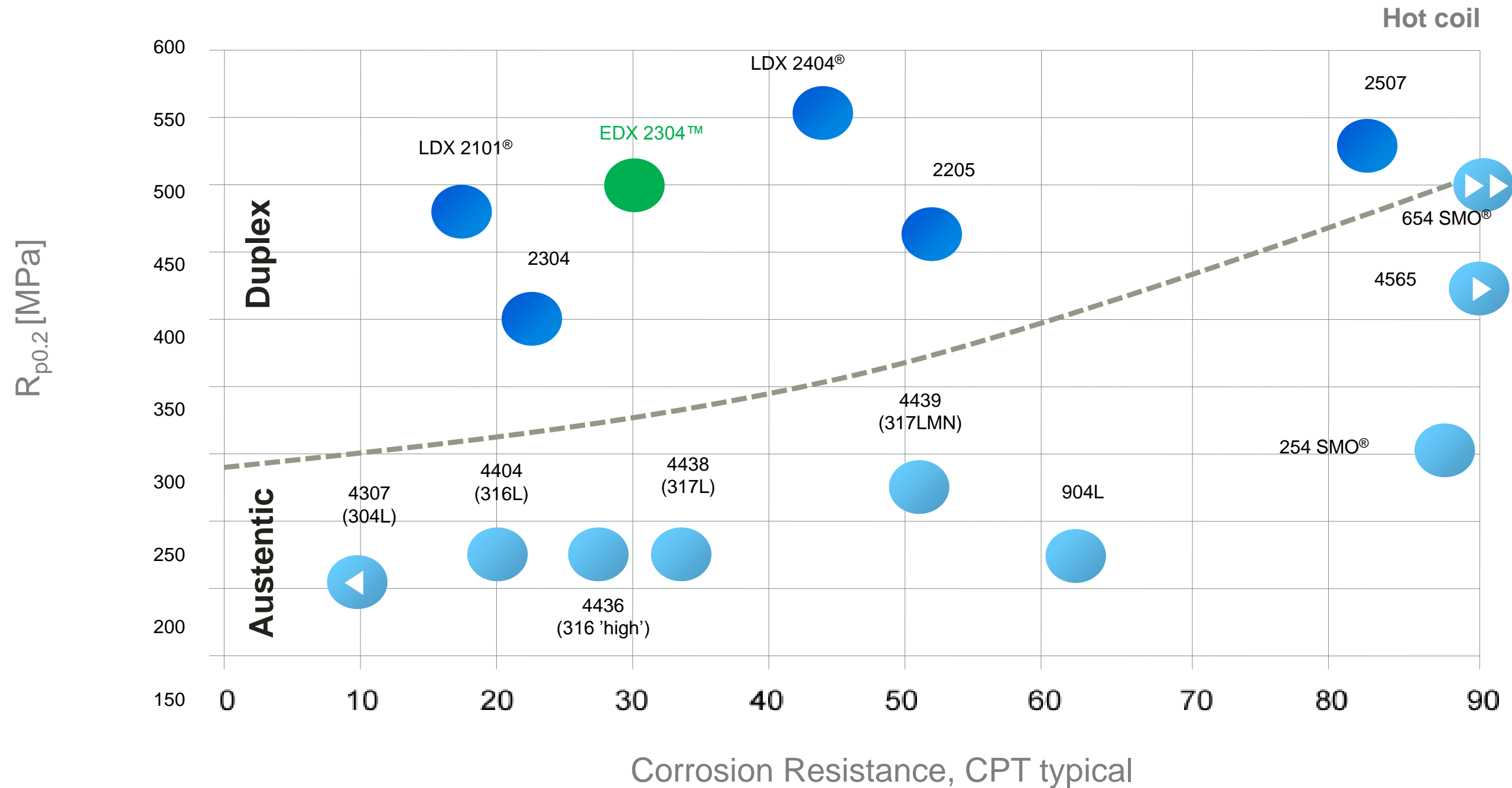
Material cost, welding and assembly cost, surface treatment cost etc.

Total life cycle cost

Maintenance cost: Recoating costs, production loss, scrap value etc.

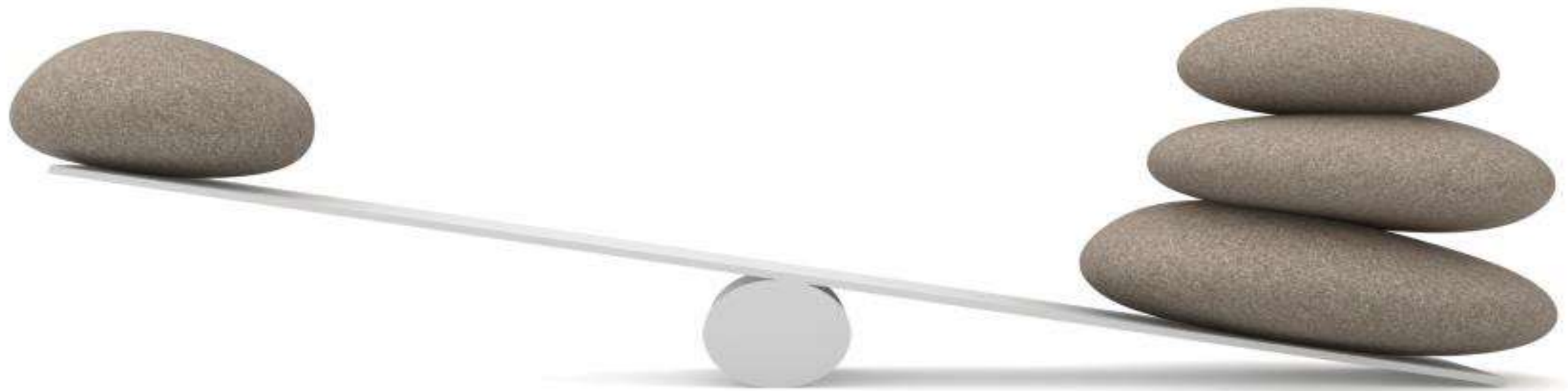
Positioning of Duplex Stainless Steel grades

An excellent combination of high strength and corrosion resistance



Austenitic

Duplex



The world's first foot bridge in Outokumpu Duplex LDX 2101®

Across the rapids, Likholefossen, Norway - 2004

- Stainless LDX 2101
 - No maintenance
 - Cost efficiency
 - Aesthetics
 - Stiffness
 - Strength= low weight = easy erection (by helicopter)



First stainless railway bridge in the world!

Añorga Bridge – Spain, 2011

Old bridge in carbon steel replaced due to:

- Heavy corrosion damage
- Heavy maintenance demand

New bridge in Duplex LDX 2101

The owner required:

- 120 year design life
- Minimized maintenance
- Light weight (high strength) structure due to access during construction.
- Solution: Outokumpu LDX 2101



The entire truss structure in Duplex LDX 2101, thickness 12-23 mm,
130 tons

Duplex Stainless Steel in Bridges

Over the last 10 years stainless steel has emerged as a material in all areas of bridge construction:

For instance

- Critical components
- Loadbearing structures
- Reinforcement
- Or simply as a material for the complete bridge

During this development one class of stainless steel has come to the forefront... The Duplex Stainless Steels



Stonecutters Bridge, Hong Kong



Advanced materials

Aesthetic material

Marina Bay Pedestrian Bridge

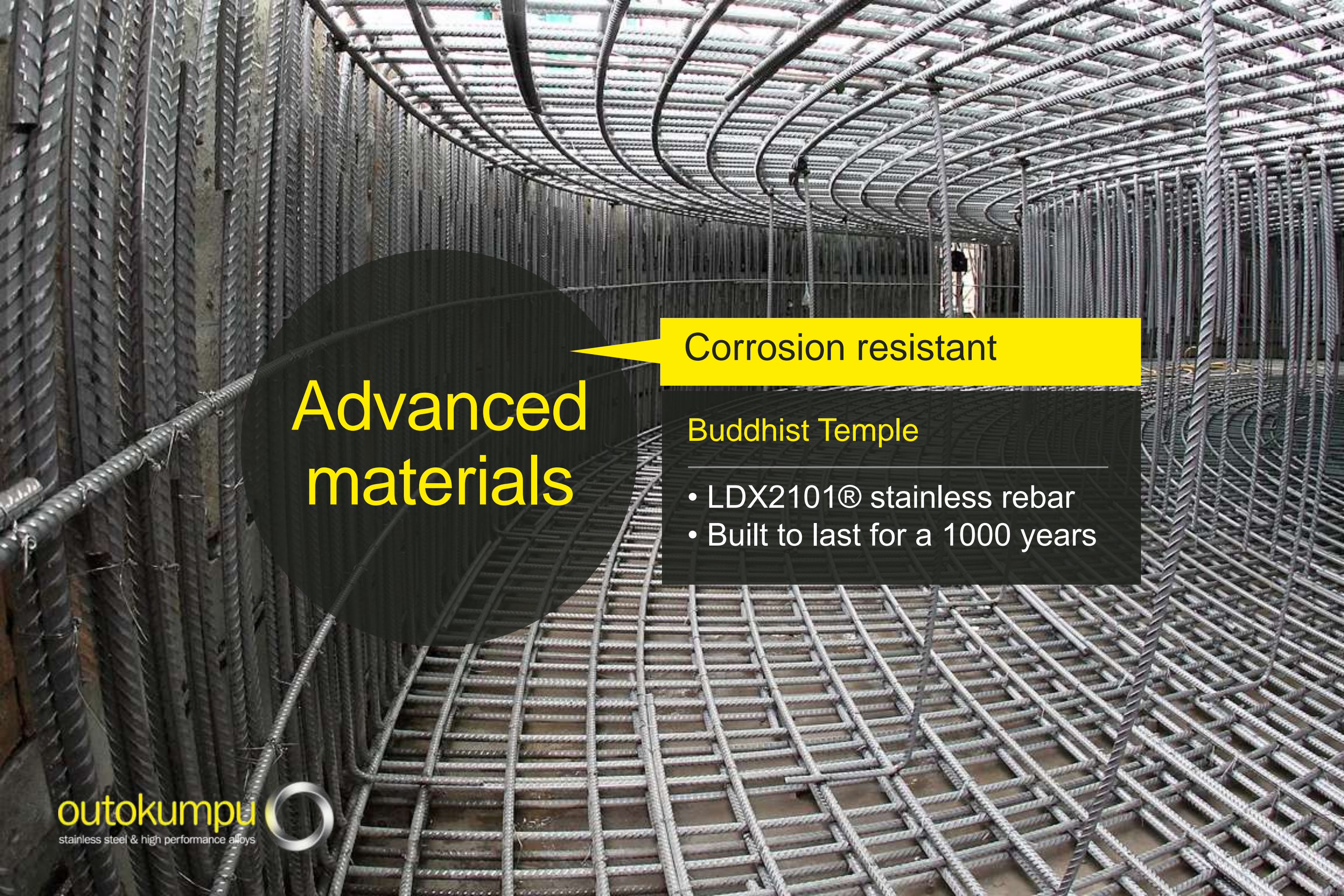
- 280 meters long and 6 meters wide
- Duplex 2205, tailor-made plates and pipes
- Designed for a 100 years service life



A low-angle, perspective shot of a modern bridge railing made of polished stainless steel. The railing curves along the edge of a concrete bridge deck. In the background, the bridge's orange-painted steel towers and stay cables are visible against a clear blue sky. The railing has a sleek, cylindrical design with a horizontal bar and a vertical post.

San Diego Harbor Drive bridge

- Design for over 100 year service life
- Duplex 2205



Advanced materials

Corrosion resistant

Buddhist Temple

- LDX2101® stainless rebar
- Built to last for a 1000 years

Advanced materials

Aesthetic material

Birmingham's New Street station

Advanced materials

Cost efficiency

Chrysler building

- Austenitic stainless steel

Stainless Steel for Elevated Structures

Skywalk Railings – Safety – light weight structure – low maintenance – elegant look



Mumbai Skywalk

Stainless steel water bridges in Japan

Lightweight bridges are used to carry potable water and pedestrians across river spans up to 632 m

85% Type 304

10% Type 316

Some 2205 near the coast

First one built: 1983

Max pipe diameter: 0.8 m

Max weight of stainless steel: 45 tons

There are now 2000 - 3000 such bridges in Japan (10,000 tons of stainless steel)



**Outokumpu LDX 2101 replacing carbon
Steel! Footbridge in India, length 42 meter
Calculated safe weight saving is **32%****



Bus Shelters, India
Outokumpu LDX 2101 versus type 304
Weight saving **20% when selecting LDX 2101**
Also better corrosion resistance!



A new Duplex Steel landmark

The Ljunga Bay Bridge in Sölvesborg, Sweden

- 756 m total length, 3,5 m wide
- 3 arches, 60 m span, carrying the higher deck section. Arches made from duplex stainless steel plate LDX2101®
- Railings and deck support structure in lean duplex stainless steel LDX2101®



Probably the longest pedestrian bridge in Europe

Qatar Foundation New Headquarters

- Grade Duplex 2205 (1.4462)
- In total 170 tons of Structural sections
- 179 Hollow sections in 17 different dimensions
- 35 different L-profiles



”Outokumpu Added value in a nutshell”



Duplex Stainless Steel for Marine Environment Structures

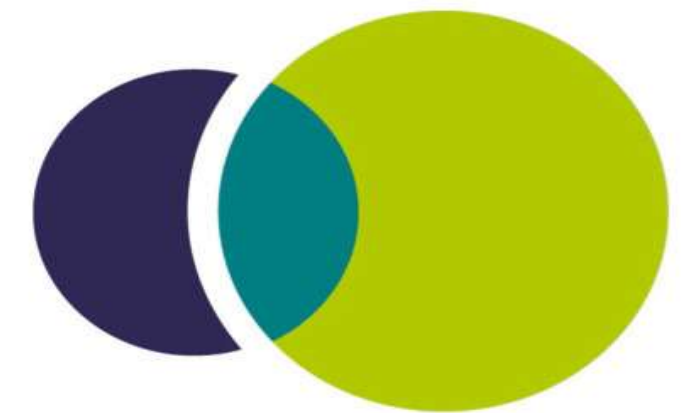
Qatar faculty of Islamic studies Duplex 2304 (1.4362)




Picture courtesy of Mangera yvars architects

Outokumpu leads in sustainability in stainless industry

- Recycled content of Outokumpu steel is 90% against the industry average of 60%.
- Dow Jones Sustainability Index: Outokumpu is an Industry benchmark in environmental dimension; Best environmental score globally.



**Dow Jones
Sustainability Indexes**



Outokumpu
stainless
steel

100% Recyclable

>80% Recycled content



Some things
should last
forever.