

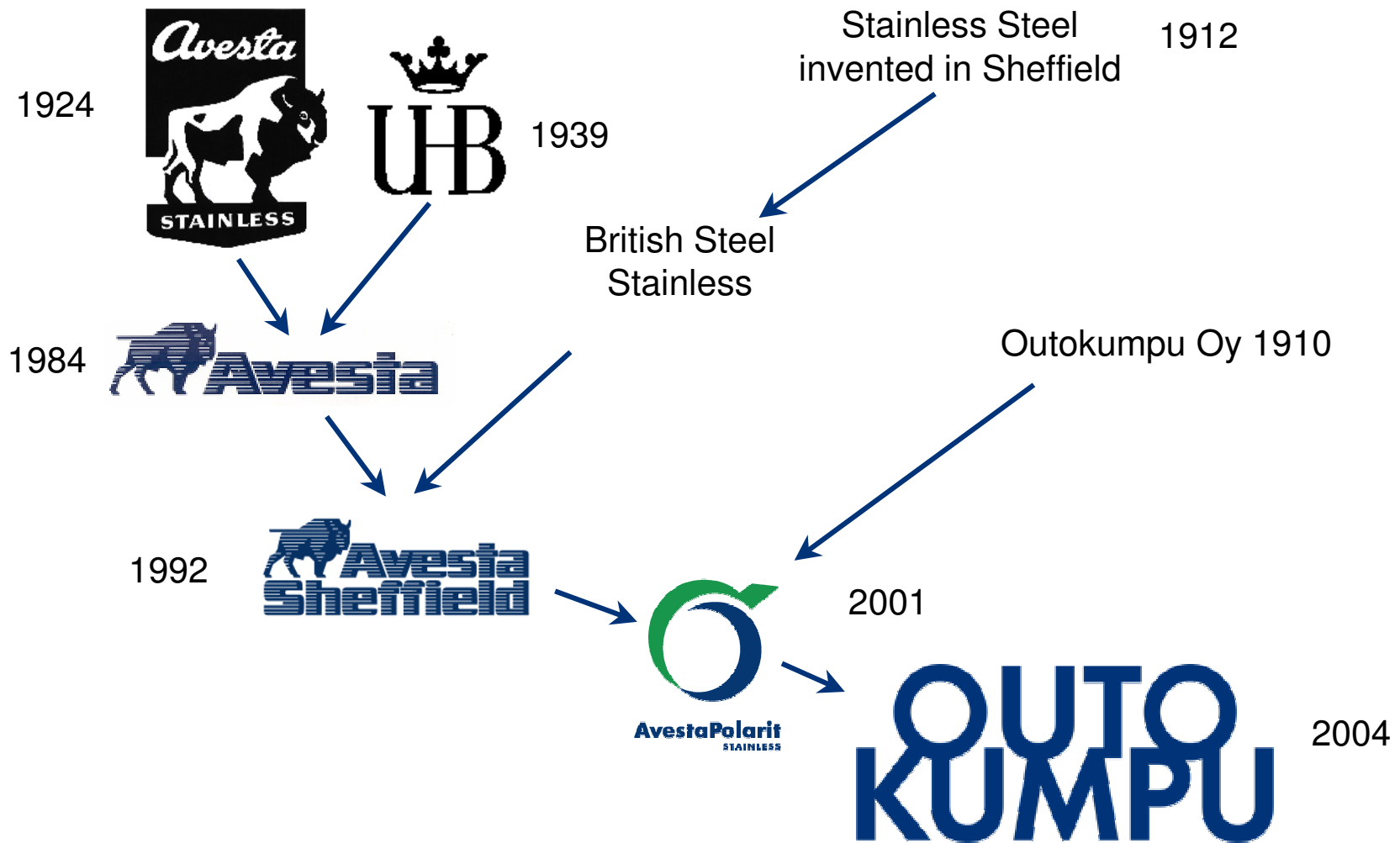


DUPLEX STAINLESS STEELS : WINNING SOLUTION FOR INDIA

MMMM 2011

www.outokumpu.com

Longest Stainless Experience STAINLESS ORIGIN CAN BE TRACED IN OUTOKUMPU



Decreasing the carbon footprint Outokumpu leading the way

- Outokumpu products' carbon footprint smallest in the EU
- In the last ten years the Group reduced its direct carbon dioxide (CO₂) emissions by 25% per ton of stainless steel produced.
- All identified minimum footprints were resulting from
 - Improved processes
 - High proportion of recycled steel 90%
 - Low-carbon electricity mix : 80% renewable & Nuclear
- Outokumpu adheres to the strictest ethical principles in conducting business:
 - Human dignity
 - Our planet for the future
 - Good corporate citizenship
 - Healthy workplace



OUTOKUMPU
is Committed to the environment

INDIA : AS WORLD SEES US

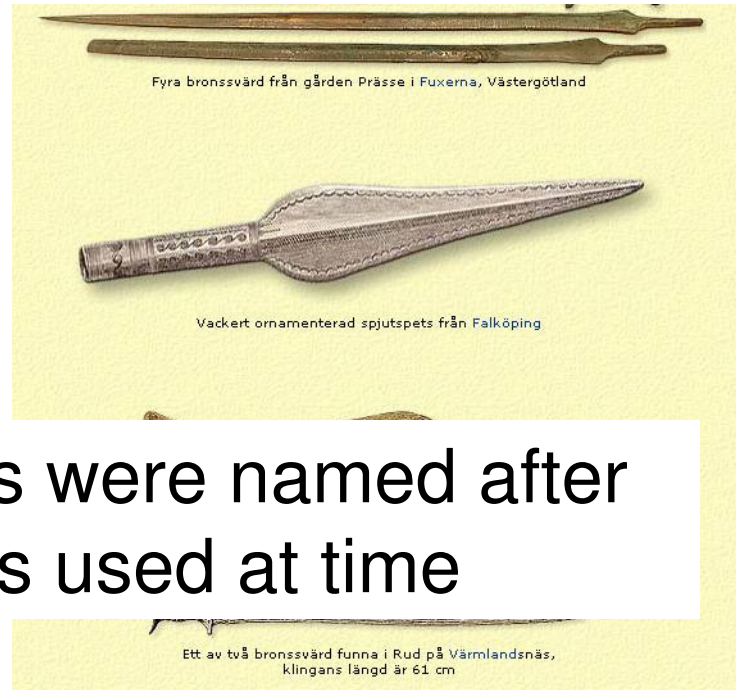
- Growing Economy - A Land of Opportunities
- Largest pool of technical capabilities
- People with CAN DO attitude
- Going to be the Business Hub of the World
- India is also known as A LAND OF JUGAAD (any thing substandard is accepted in INDIA)
- BUT NOT ANYMORE...
- The need is to have everything that meets ANY international standard - Nothing Less than That will be Accepted

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 Stainless India.

Civilisation is a good teacher on evolution : Different epochs in the history of humans



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



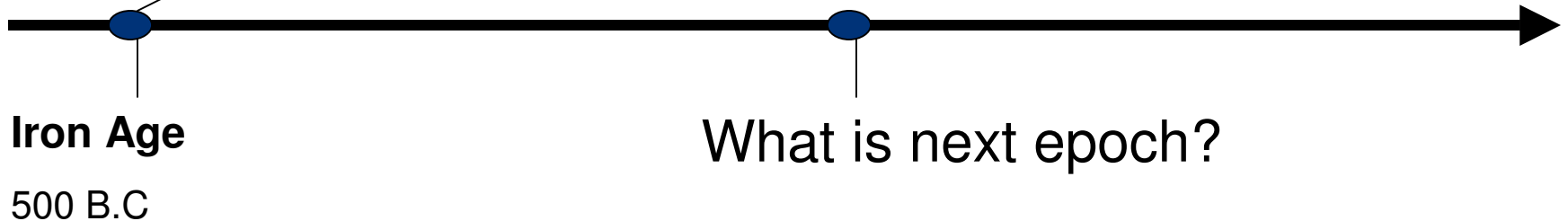
Different epochs in the history of humans



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!!



Different epochs in the history of humans



Iron Age

500 B.C

Duplex Age

2000 A.C

The DUPLEX Family

- A family of stainless steels with :
 - Very High Mechanical Strength
 - Very High Corrosion Resistance
- What makes Duplex so Strong ?
 - Secret lies in connecting the best of both micro-structures i.e. Austenite & Ferrite
 - Two crystallographic phases, each with composition sufficient to make it corrosion resistant
 - Phases in Duplex Grades are body Centered cubic phase - Ferrite and Face Centered Cubic Phase (Austenite)
 - Thus the properties of both the phases are used in one alloy.

Chemical Composition %

Typical chemical composition weight-%

Outokumpu	EN	ASTM	Cr	Ni	Mo	N	PRE*	R _{p0.2} **	
LDX 2101®	1.4162	S32101	21.5	1.5	0.3	0.22	26	450 ^{***}	Lean Duplex
2304	1.4362	S32304	23	4.8	0.3	0.10	26	400	Duplex
2205	1.4462	S32205	22	5.7	3.1	0.17	35	460	Duplex
SAF 2507®	1.4410	S32750	25	7	4	0.27	43	530	Superduplex
4501	1.4501	S32760	25.4	6.9	3.8	0.27	42	530	Superduplex
4307	1.4307	304L	18.1	8.1	-	-	18	200	Austenitic
4404	1.4404	316L	17.2	10.1	2.1	-	24	220	Austenitic
4432	1.4432	316L	16.9	10.7	2.6	-	25	220	Austenitic
904L	1.4539	N08904	20	25	4.3	-	34	220	Austenitic
254 SMO®	1.4547	S31254	20	18	6.1	0.20	43	300	Superaustenitic
4529	1.4529	N08926	20.5	24.8	6.5	0.20	45	300	Super austenitic

* PRE = %Cr + 3.3x%Mo + 16x%N

** [MPa] hot rolled plate, minimum values at 20°C acc to EN 10088

***Not yet in EN 10088, Rp0.2 acc to ASTM A240

Mechanical properties

Mechanical properties*								
Outokumpu	EN	ASTM	E modulus (GPa)	R _{p0.2} (MPa)	R _m (MPa)	A ₅ (%)	PRE**	
LDX 2101®	1.4162	S32101	200	450***	650***	30***	26	Lean Duplex
2304	1.4362	S32304	200	400	630	25	26	Duplex
2205	1.4462	S32205	200	460	640	25	35	Duplex
SAF 2507®	1.4410	S32750	200	530	730	20	43	Superduplex
4501	1.4501	S32760	200	530	730	25	42	Superduplex
4307	1.4307	304L	200	200	520	45	18	Austenitic
4404	1.4404	316L	200	220	520	45	24	Austenitic
4432	1.4432	316L	200	220	520	45	25	Austenitic
904L	1.4539	N08904	195	220	520	35	34	Austenitic
254 SMO®	1.4547	S31254	195	300	650	40	43	Superaustenitic
4529	1.4529	N08926	190	420	800	30	45	Superaustenitic

* Hot rolled plat, min. values at 20°C acc. to EN 10088

** PRE = %Cr + 3.3x%Mo + 16x%N

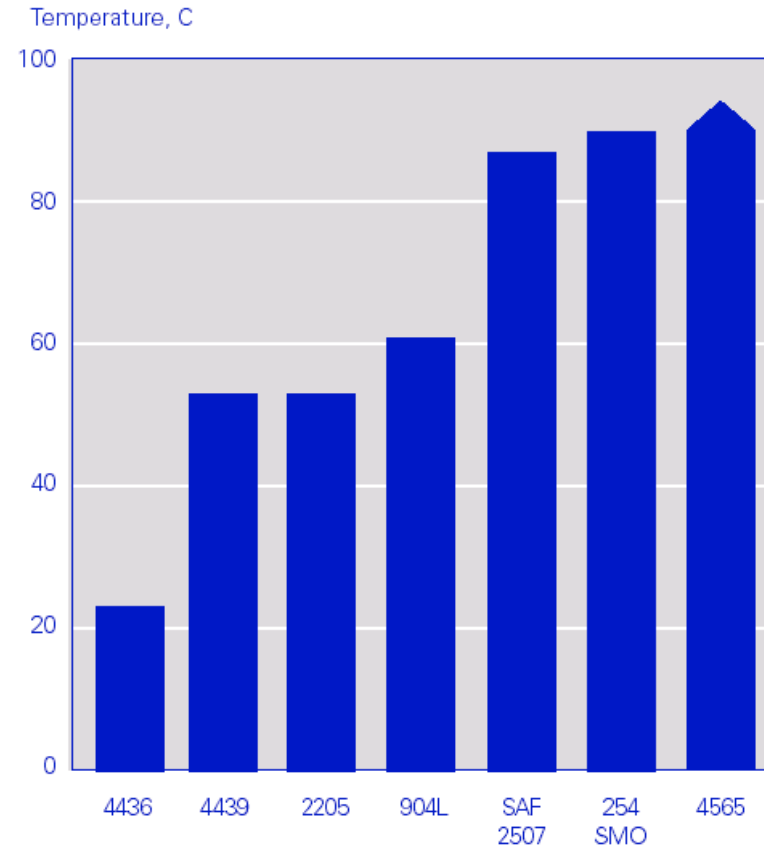
***Not yet in EN 10088, values acc. to ASTM A240

Corrosion Resistance

Steel Grade	PRE
4307	18
4404	24
4432	26
904L	34
254 SMO®	43
4565	46
LDX 2101®	26
2304	26
2205	35
2507	43

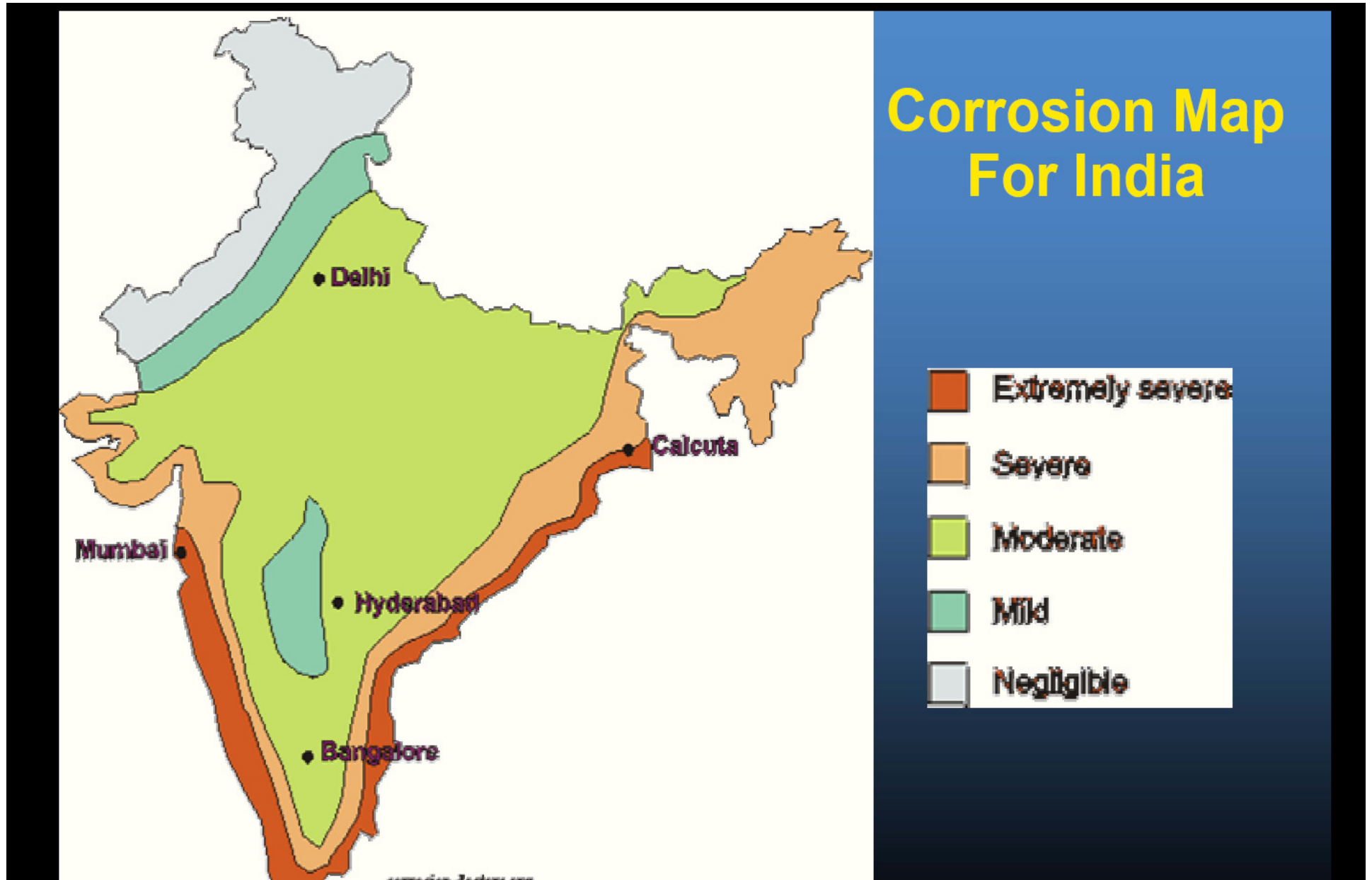
Pitting Resistance Equivalent No.

$$PREn = \%Cr + 3.3 \times \%Mo + 16x \%N$$



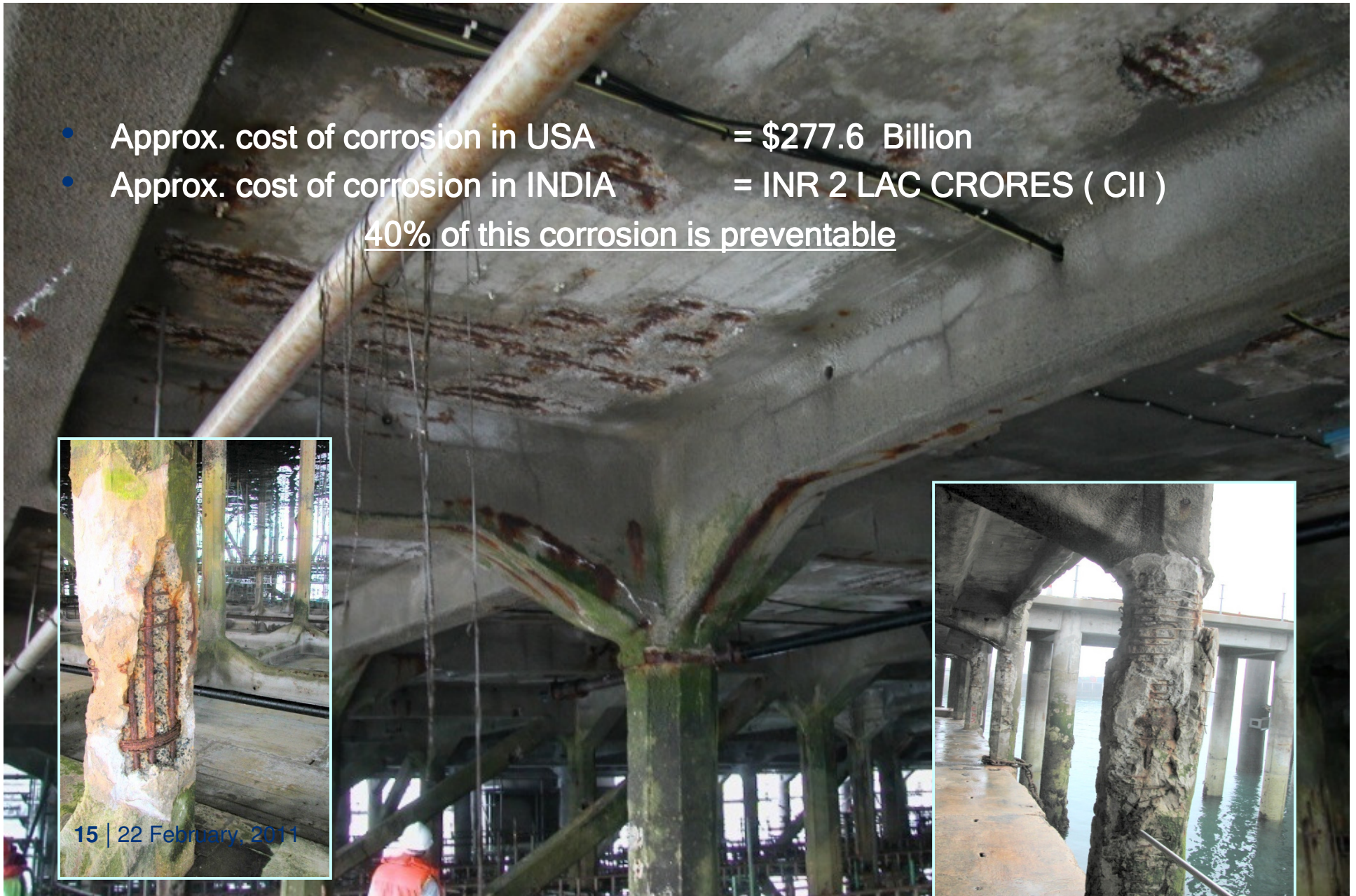
CPT according to ASTM G 150

We live in a Corrosive Country



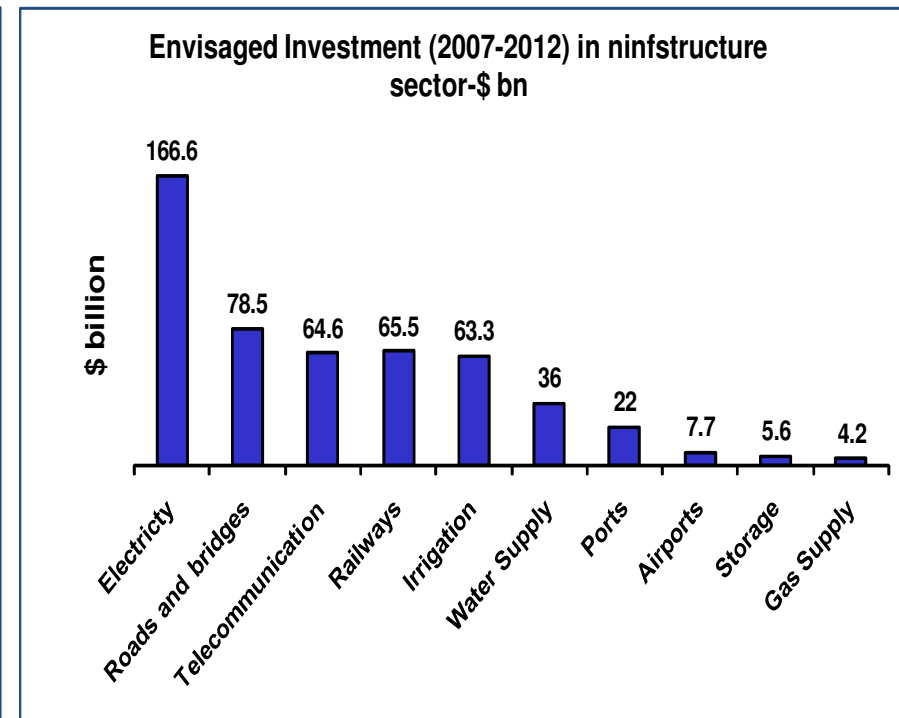
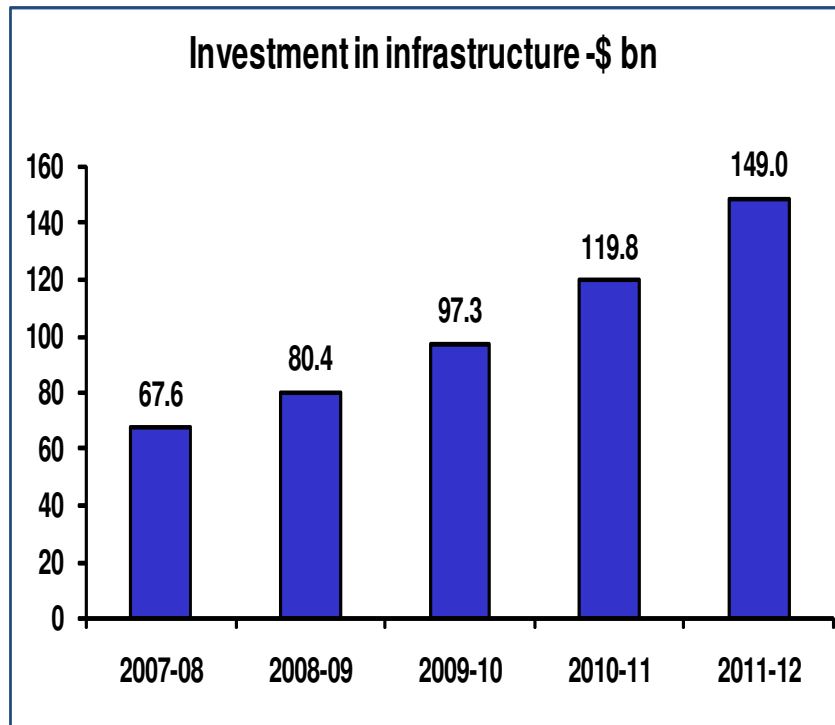
THIS IS NOT INDIA OF OUR DREAMS

- Approx. cost of corrosion in USA = \$277.6 Billion
- Approx. cost of corrosion in INDIA = INR 2 LAC CRORES (CII)
40% of this corrosion is preventable



15 | 22 February, 2011

TRILLIONS OF DOLLARS BEING INVESTED CREATING NEW INFRASTRUCTURE



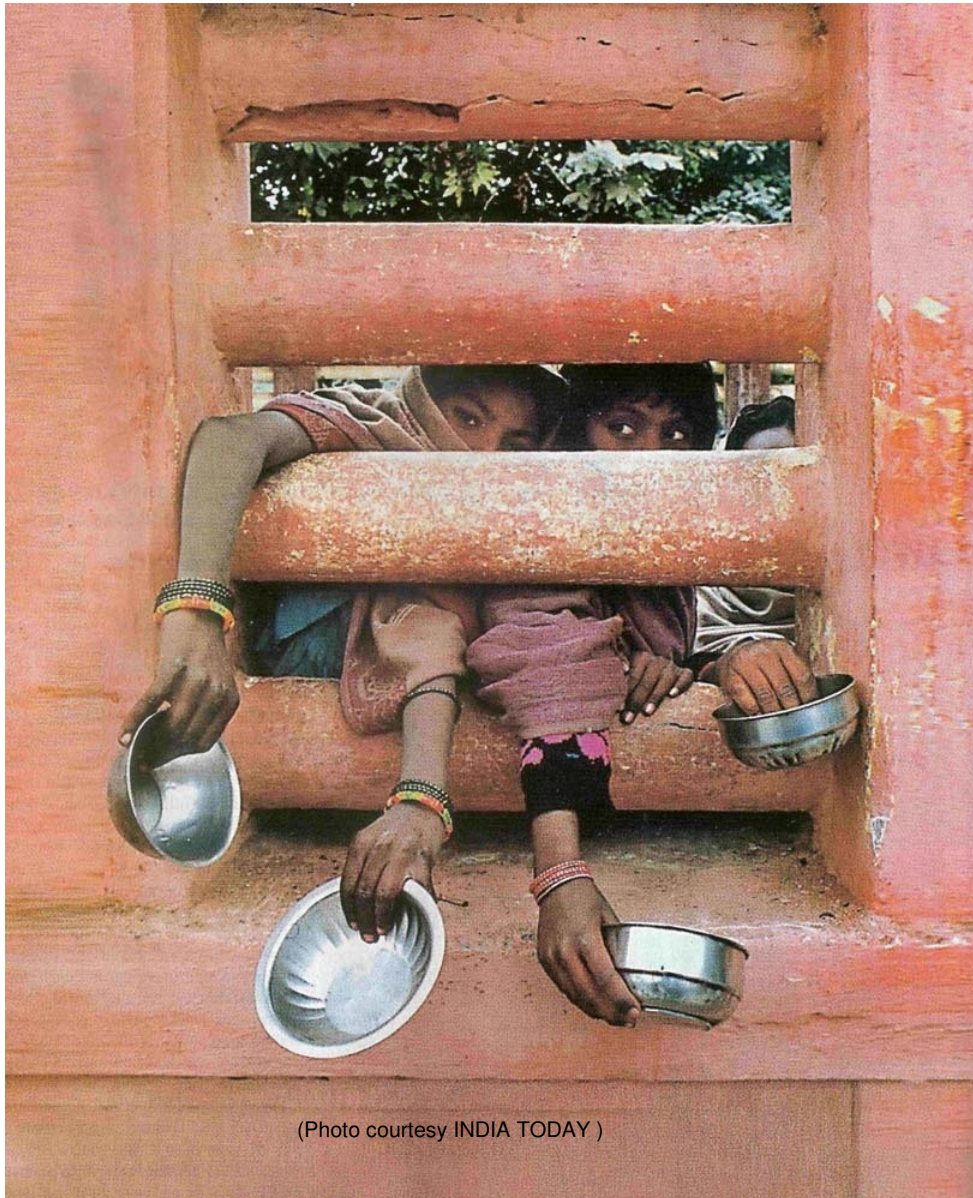
- Infrastructure investment growing 20% annually
- India will **spend \$ 1350 bn** on infrastructure development over next 8 years.~ (9% of its GDP)
- **SHOULD THIS NOT BE MAINTENANCE FREE FOR OVER 100 YEARS!**

WE HAVE A ROLE TO PLAY

NATION HAS AMBITIONS FROM US

- We need World Class Infrastructure
- We need maintenance free Infrastructure
- We need to Aim a Life of over 100 years
- We should Aim to create monuments
- We need to build a STAINLESS INDIA
- We are the builders of the Nation

INTELLIGENT INDIANS STAINLESS STEEL IS A PREFERRED CHOICE



(Photo courtesy INDIA TODAY)



Urban Development : INCREDIBLE INDIA



Mumbai Skywalk

Life Style



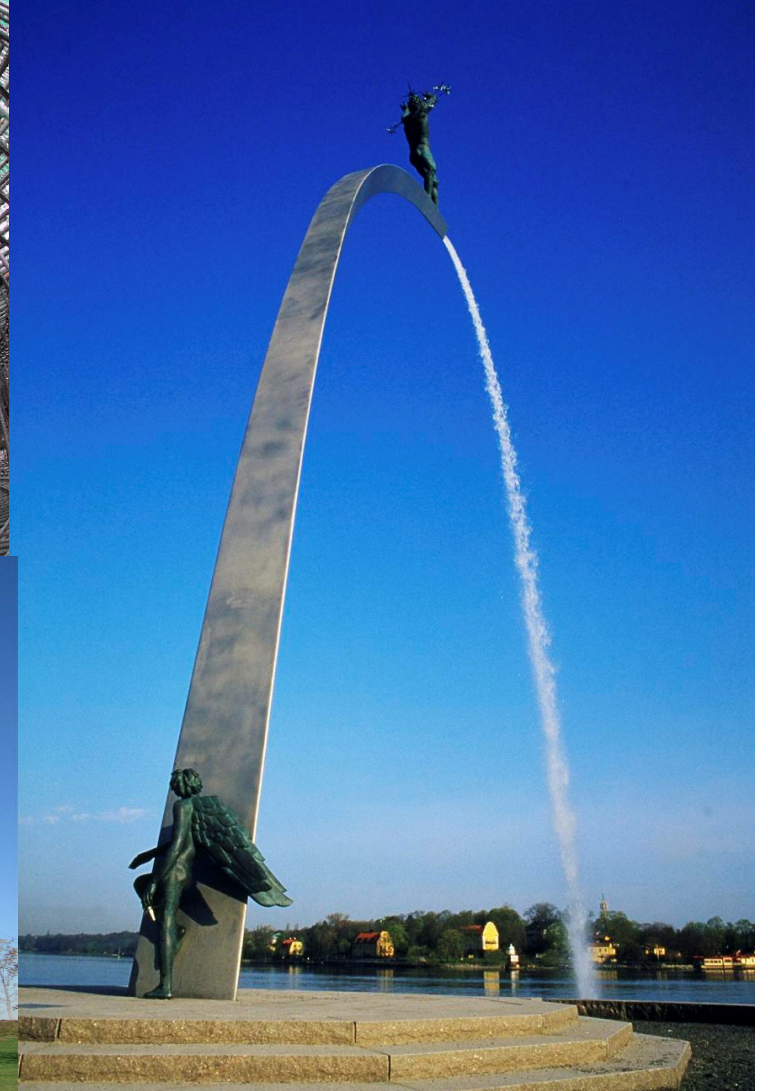
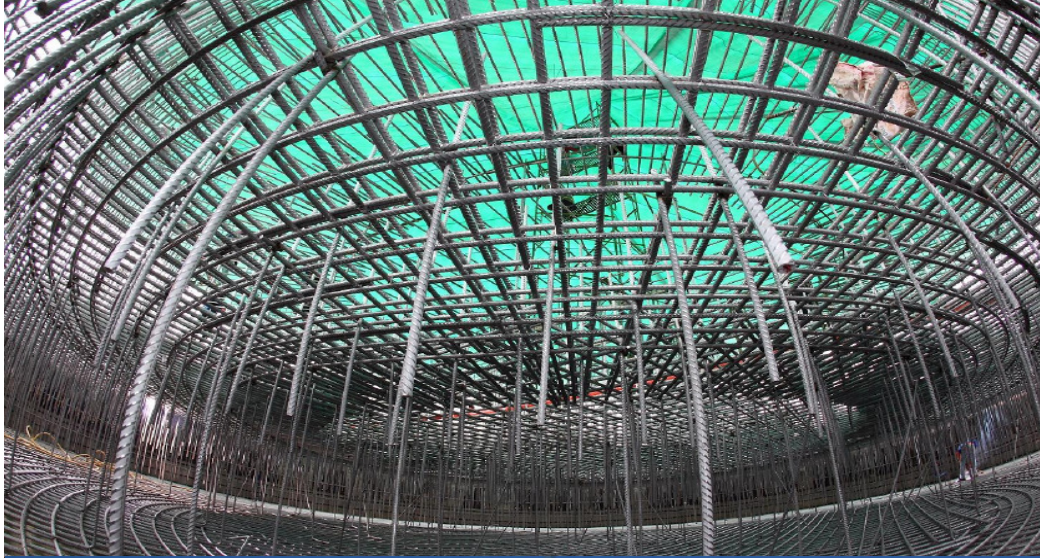
Transport Infrastructure



Water : Desalination Plants



Heritage



ACTIVATING YOUR IDEAS

