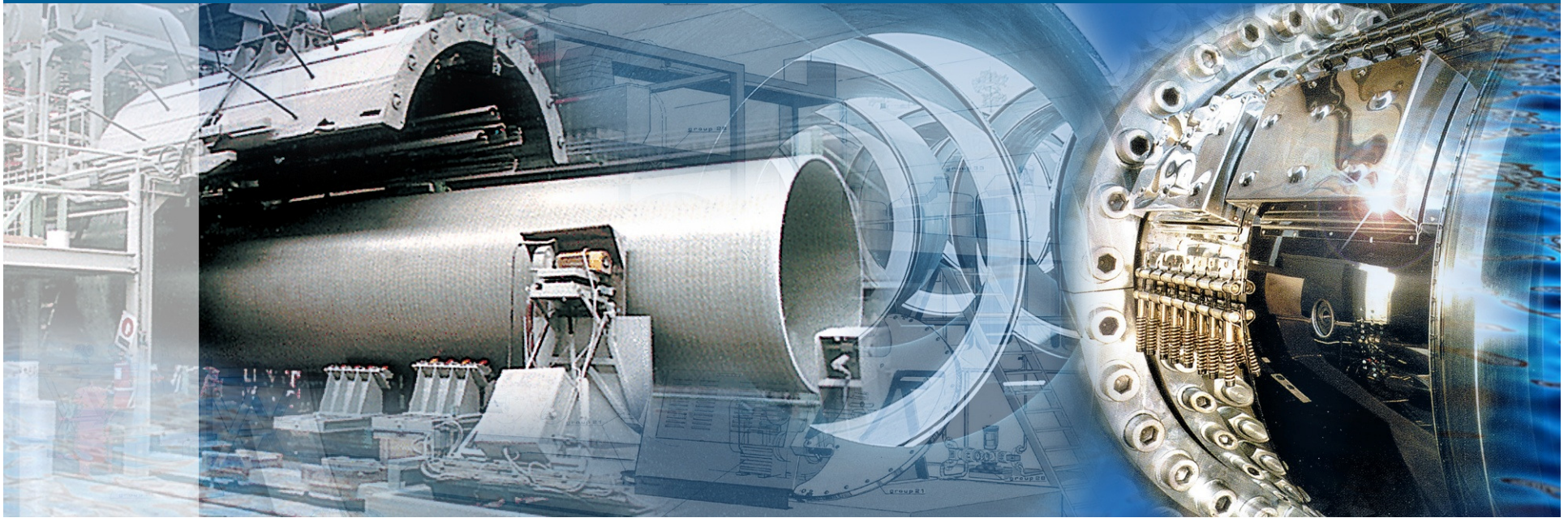


Capacity and Applications of HDPE for various piping and Experience in Middle East

AMIAANTIT PIPE SYSTEMS

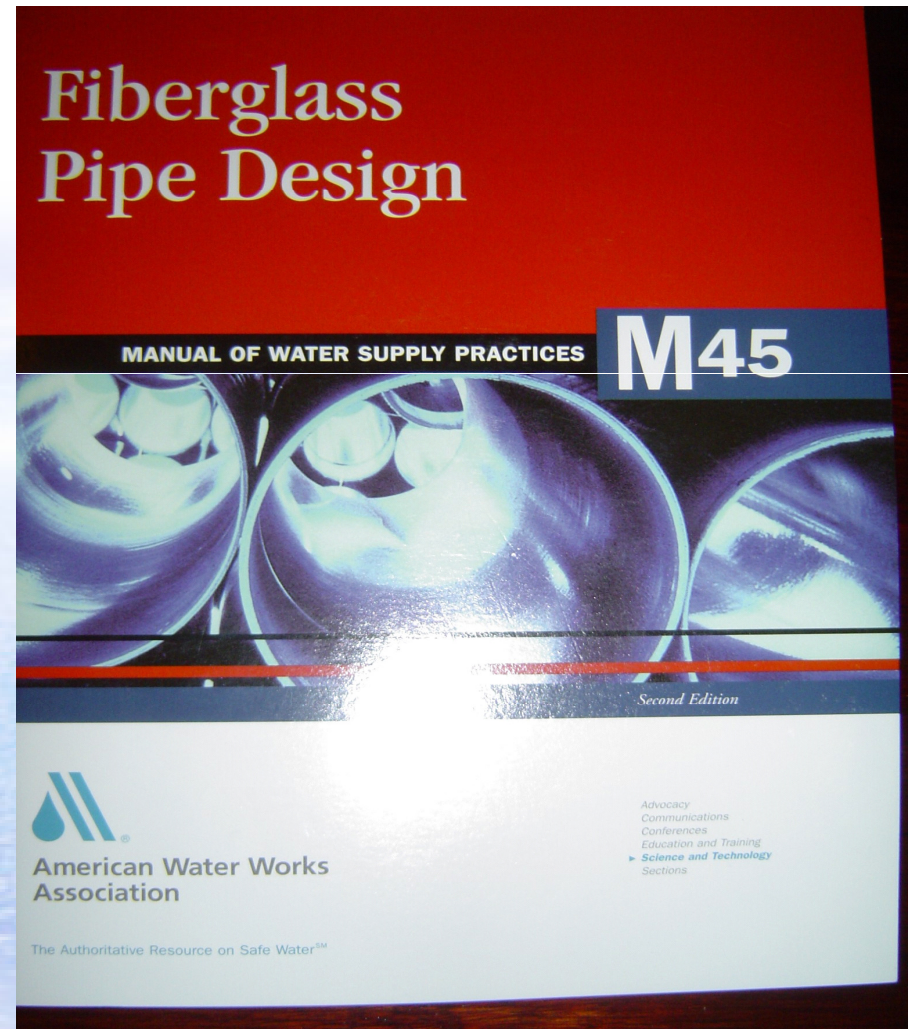


AMIAANTIT PIPE SYSTEMS











Sadath A Khan

Engineering Manager
GRP/PE Division-Amiantit Dammam
A Member of Standards Committee
AWWA C-950 and M45-for GRP Pipes
AWWA-D-120 for GRP Tanks



Topics of Presentation

AMIANITIT PIPE SYSTEMS

-  Middle East
-  Adoption of HDPE in ME
-  Advantages of HDPE
-  Applications of HDPE
-  Case Histories
-  Capacity of Amiantit
-  Cautions in specifying HDPE
-  Conclusions



AMIAANTIT PIPE SYSTEMS

Middle East

Typical Characteristics and Effects

AMIANITIT PIPE SYSTEMS

Under Ground

- ≃ Oscillating Water Tables
-  High Salted “Sabkha” Soils
-  Low Electrical Resistivity of Soils





Effects on Piping

- ≃ Differential Settlement
-  Corrosion and Bridging
-  Fast Degradation





Typical Characteristics and Effects

AMIANITIT PIPE SYSTEMS

Above Ground

-  Varying Geomorphic Conditions
-  Changing Climates
-  Fluctuating Humidity's
-  Fast Track Construction





Effects on Piping

-  Loading Effects
-  Temperature Extremes
-  Fatigue Effects
-  Durability Problems





Typical Characteristics and Effects

AMIANITIT PIPE SYSTEMS

Sea Water

-  High TDS
-  Low Tides
-  Unstable Seabed
-  Marine Growth

Effects on Piping

-  Higher Corrosiveness
-  Flash Zone Effects
-  Constructability
-  Hydraulic Effects

Iron and Steel Pipe Failures Due to Corrosion

AMIAANTIT PIPE SYSTEMS



Iron and Steel Pipe Failures Due to Corrosion

AMIANTIT PIPE SYSTEMS

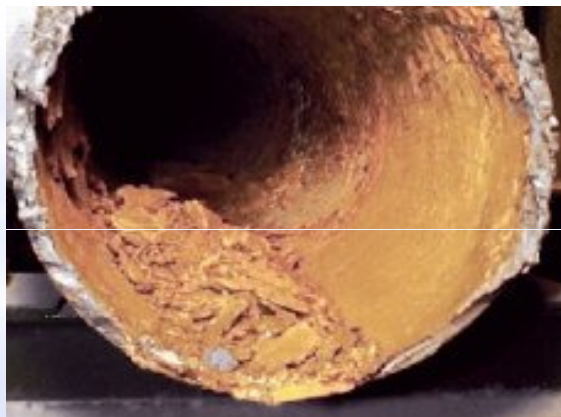


Iron and Steel Pipe Failures Due to Corrosion

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Environmental corrosion MIC in concrete

Galvanic corrosion

AMIANITIT PIPE SYSTEMS

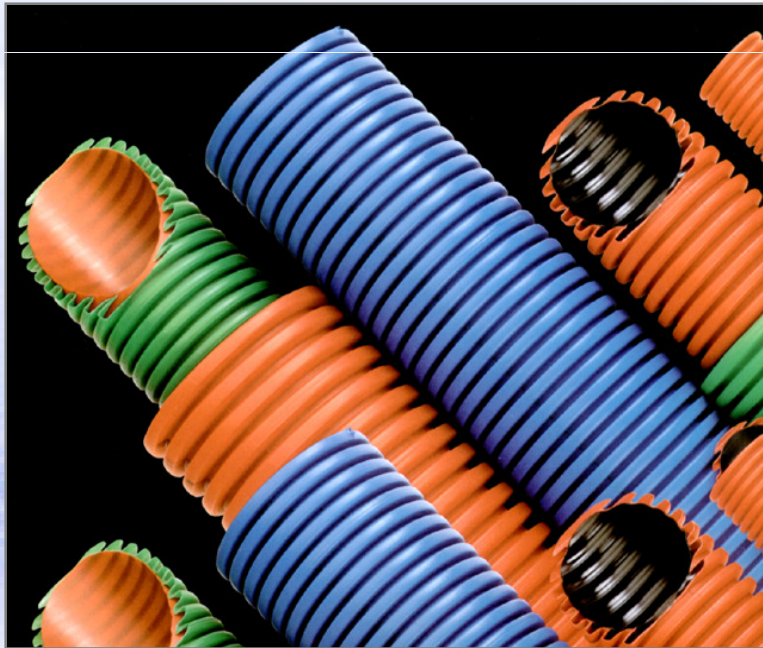
Answer is HDPE– Why?

One of the best possible Answer is HDPE

AMIANITIT PIPE SYSTEMS

HDPE (High Density Poly-Ethylene)

PP- C (Poly-Propylene - Copolymer)



Features And Benefits

AMIANITIT PIPE SYSTEMS

Light Weight

- 1/8 of the steel weight
- Easy to handle
- Reduce Installation cost & time



Features And Benefits

AMIANITIT PIPE SYSTEMS

Very Flexible Materials

- o Unaffected by soil settlement
- o It can be bended (fewer fittings)
- o Suitable for relining and trenchless techniques
- o High strain allowance resulting higher flexibility in both design and installation



Features And Benefits

AMIANITIT PIPE SYSTEMS

High Corrosion Resistance

- o Lower life cycle cost
- o Does not rust, decay or corrode
- o Does not require corrosion protection
- o Does not require maintenance
- o Sustain aggressive soil conditions
- o Life expectancy in excess of 50 years

Features And Benefits

AMIANTIT PIPE SYSTEMS

Chemical Resistance

- o Suitable for use with a broad range of chemicals
- o Resistance to all natural gas constituents.
- o Resistance to sulfuric acids up to 80% concentrations.
- o Insoluble in organic and inorganic solvents up to 70°

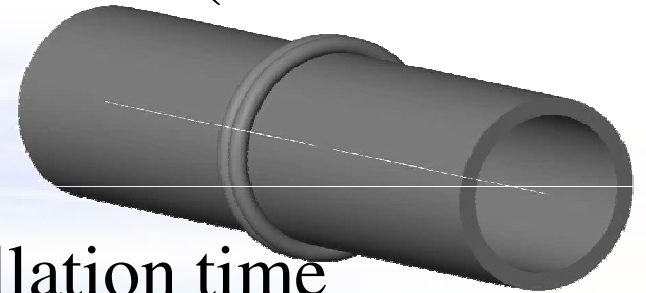
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Features And Benefits

AMIANITIT PIPE SYSTEMS

100% Leak Tight Jointing System

- o Welded joint result in joint-less pipe line (leak free)
- o No infiltration or Exfiltrations
- o Easy and fast jointing reduce installation time
- o Joints are fully restrained .does not require thrust block
- o Potable water losses and ground water treatment costs encountered with traditional piping systems are eliminated



Features And Benefits

AMIANITIT PIPE SYSTEMS

Non-Toxic Materials

- o Approved for use in potable water applications
- o Approved for use in food contact applications
- o Can be used for medical applications



Features And Benefits

AMIANITIT PIPE SYSTEMS

UV-Resistance

It is not affected when exposed to direct sun light



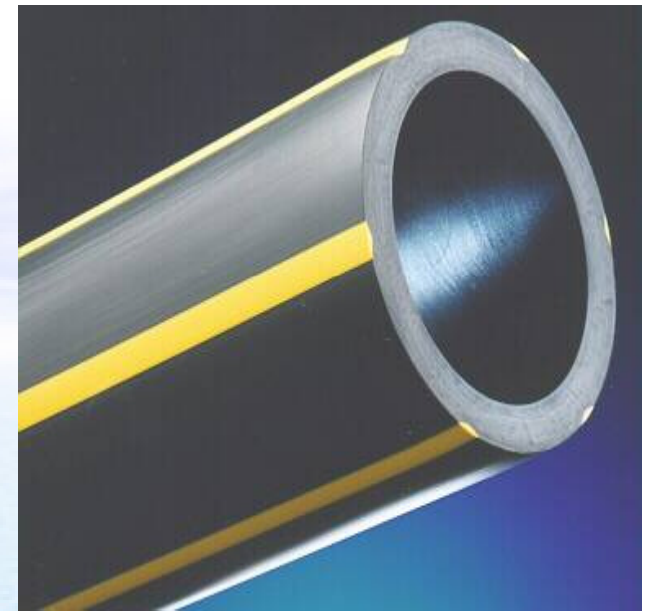
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Features And Benefits

AMIANITIT PIPE SYSTEMS

Excellent Flow Characteristics

- o Smooth inner surface
- o Less pumping cost
- o Smaller pipe diameter can be used for the same flow rate compared to traditional materials
- o *And it can be evaluated by no or minimal Pressure drops and this is due to low Friction*



Features And Benefits

AMIANITIT PIPE SYSTEMS

Pipe	C value
HDPE	155-160
PVC	130-150
New steel pipe	130
Glass tubing, Asbestos cement	130
New cement-lined ductile iron	130
Old steel pipe	125
Concrete, wood stave	120
Galvanized steel	110
Old cast iron, old galvanized steel	100
Corrugated steel pipe	60

Features And Benefits

AMIANITIT PIPE SYSTEMS

Impact Resistance

- o Excellent resistance against breakage or damage
- o Easy to handle
- o High impact resistance even at very low temperatures up to -60°C



Features And Benefits

AMIAANTIT PIPE SYSTEMS

Longer Pipe Length Sections

- Faster to install and Fewer joints
- Reduced installation cost and time
- Amiantit HDPE pipes of OD 16 mm up to 110 mm can be provided as coils depending on:
 - pipe specification
 - coil dimensions.
 - container/truck dimensions

The Coil inside diameter should be more than 18 times the pipe OD.

Min Coil ID = 18 x Pipe OD mm



Transportation of Coiled PE Pipes

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Flexibility of PE Pipes

AMIANITIT PIPE SYSTEMS



◦ Transition - Flanges

AMIANTIT PIPE SYSTEMS



Transition - Flanges

AMIAANTIT PIPE SYSTEMS



Transition – Flanges-DI

AMIANTIT PIPE SYSTEMS



Transition – Flanges-Steel

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Transition – Flanges-Asbestos

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Fewer Bends and Fittings

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Comparison PE – Metal (advantages PE)

AMIANITIT PIPE SYSTEMS

- o higher flexibility
- o possibility to coil
- o no corrosion
- o impact resistance
- o smooth internal and external surfaces
- o lower weight
- o no necessity for cathodic protection
- o possibility to squeeze-off pipes
- o easy jointing technique
- o lower installation costs, no thrust blocks required
- o longer working life



Comparison PE – Metal (disadvantages PE)

AMIAANTIT PIPE SYSTEMS

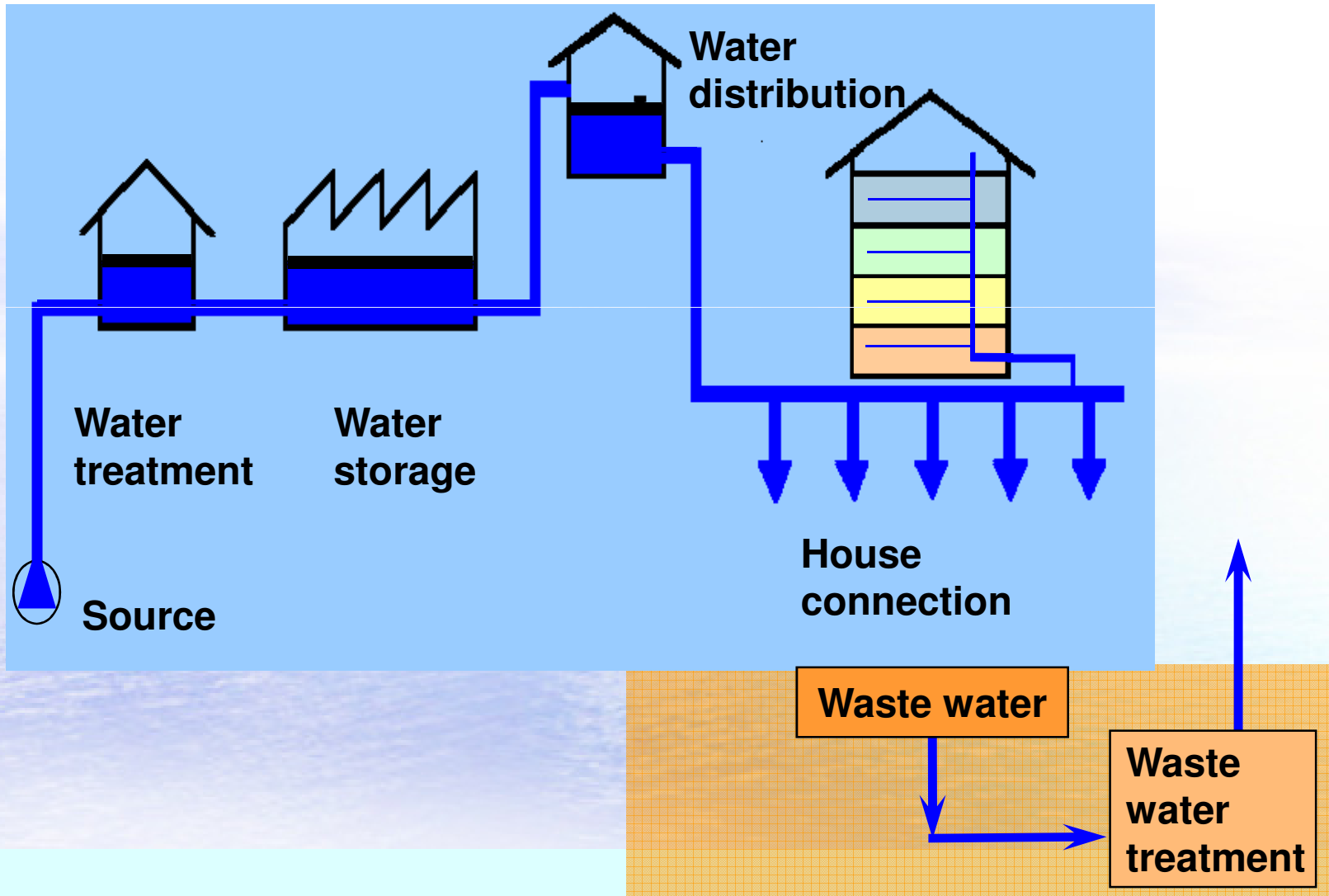
- higher sensitivity of the material to
 - temperature changes
 - mechanical loading
- initial investment in equipment for perfect assembly
- loss of price advantage - large pipe dimensions



Applications of HDPE

PE Applications – Water Distribution

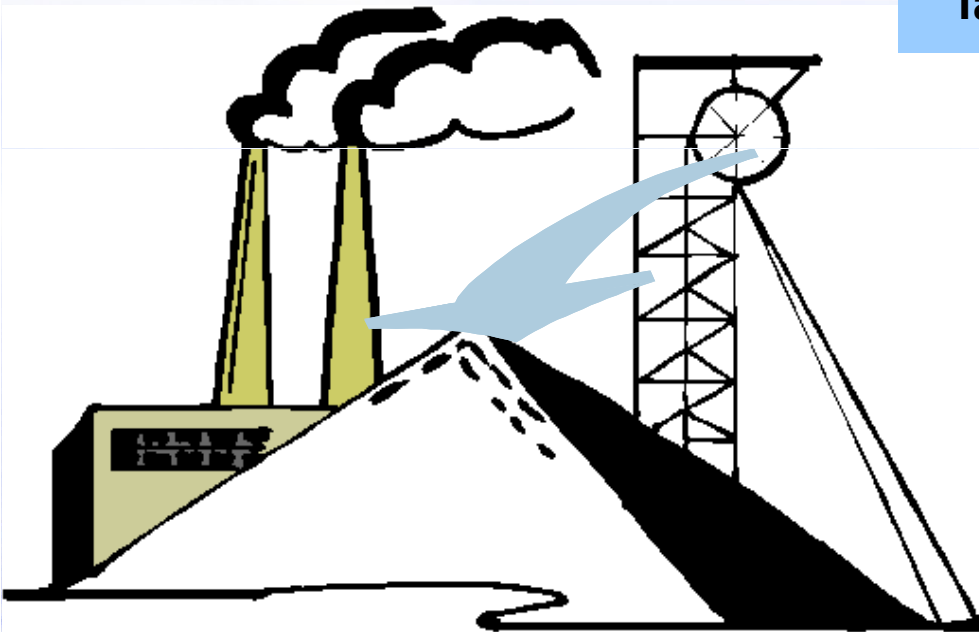
AMIANITIT PIPE SYSTEMS



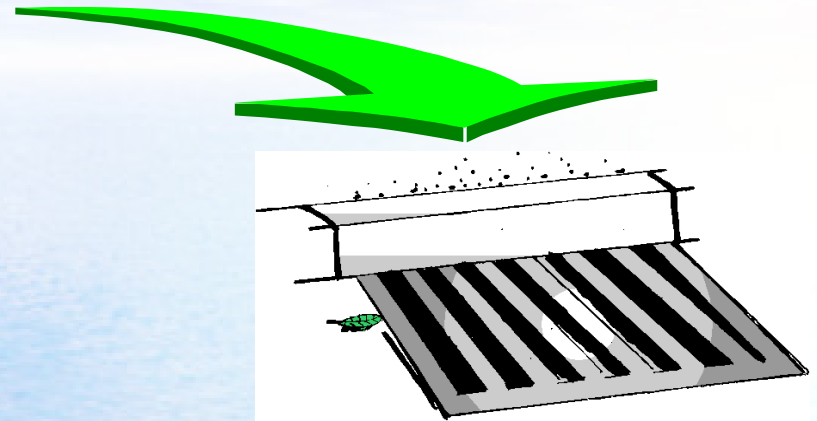
PE Applications

AMIANITIT PIPE SYSTEMS

- Sewage-(communal sewage)
- Pressurized waste-(water treatment etc.)
- Irrigation (dippers, market gardens, farms etc.)



- Cooling systems (for processing machines etc.)
- Cooling water (air conditioning etc.)
- Emergency water supplies (natural disasters etc.)

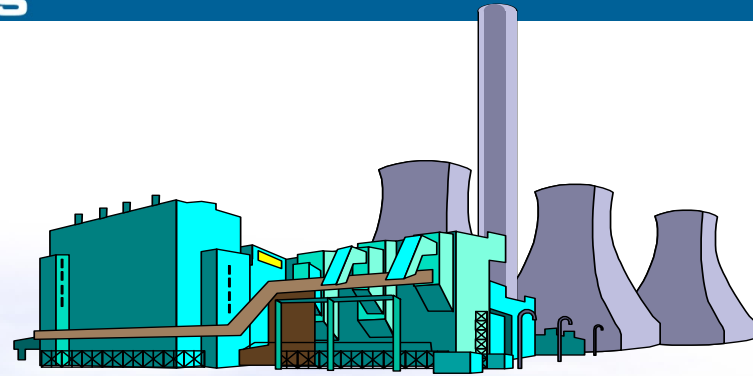


PE Applications

AMIANITIT PIPE SYSTEMS

Cooling systems

(e.g. supply, metering and monitoring systems)



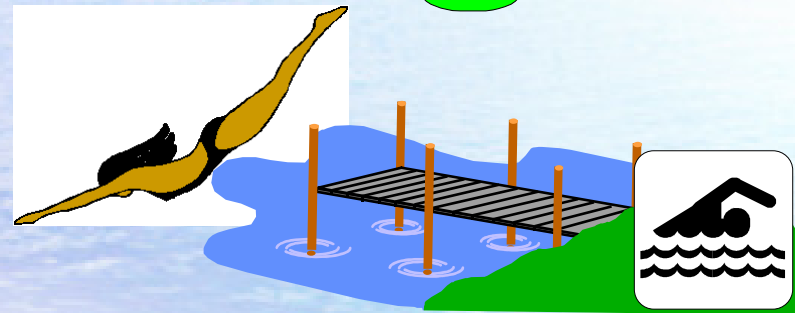
- **Liquid transportation systems**

(filling plants, liquids for processing etc.)



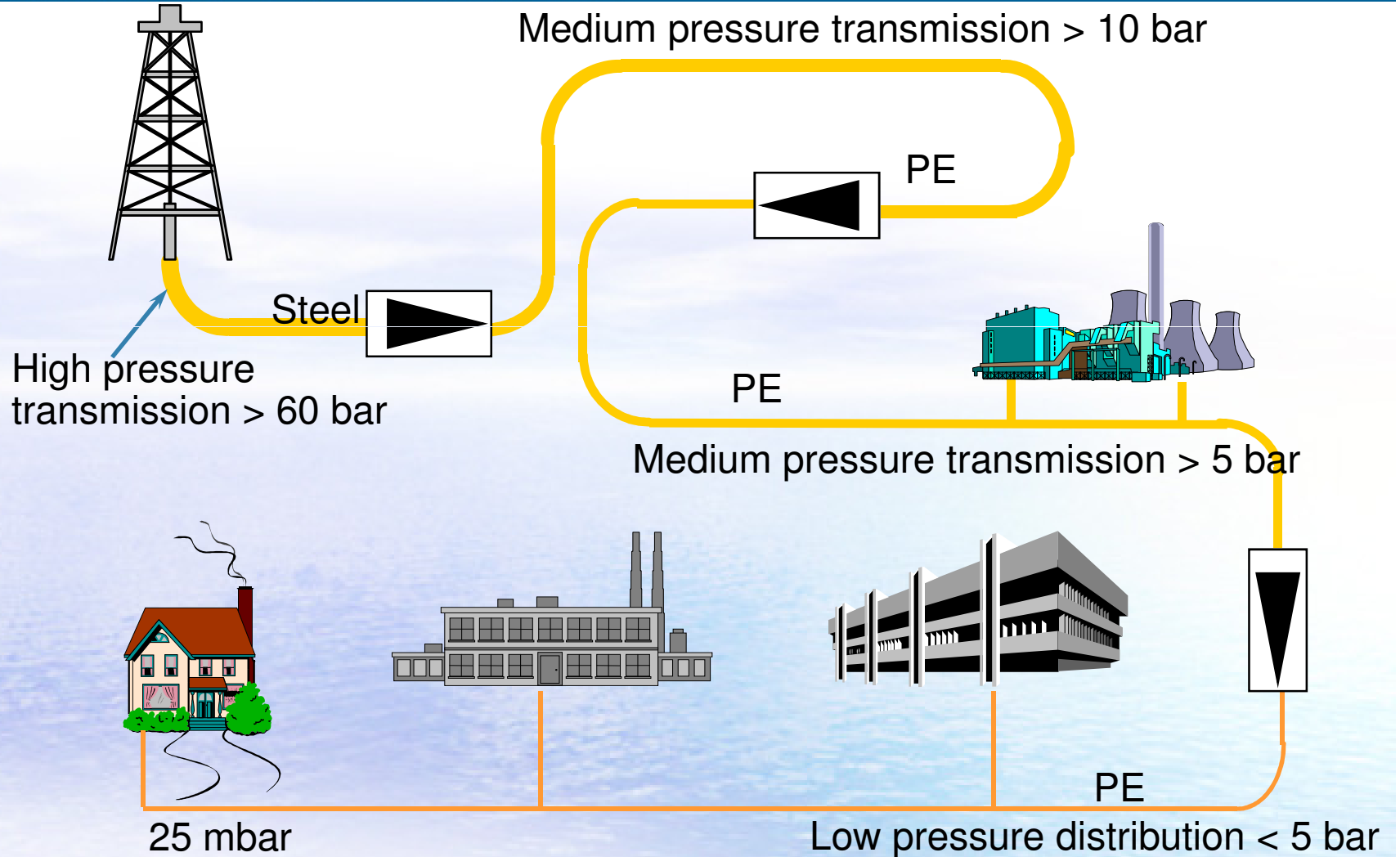
- **Health**

(i.e. swimming pools, thermal spas, hygiene)



PE Applications– Gas Distribution

AMIANTIT PIPE SYSTEMS

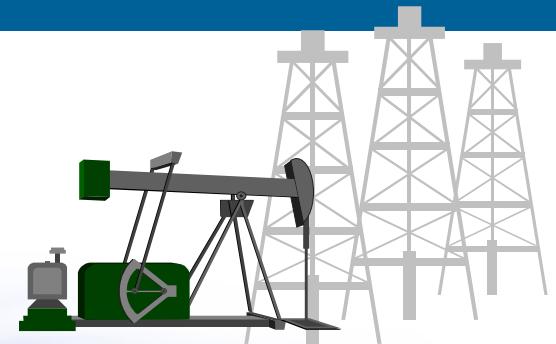


PE Applications

AMIANTIT PIPE SYSTEMS

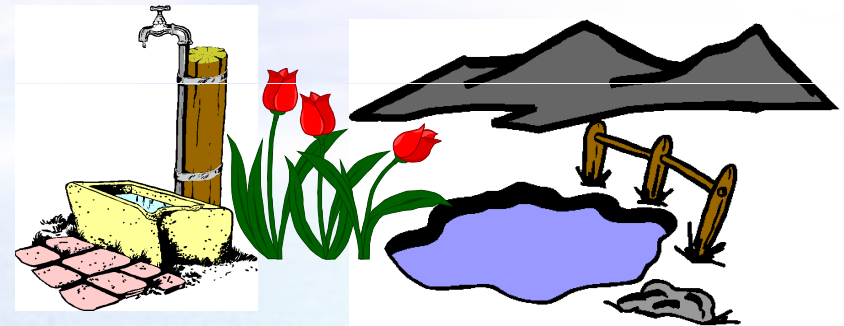
- **Mining**

(minerals, gold and silver extraction, phosphates, potash)



- **Domestic gardens**

(golf courses, public parks and fountains)



- **Vehicle cleaning**

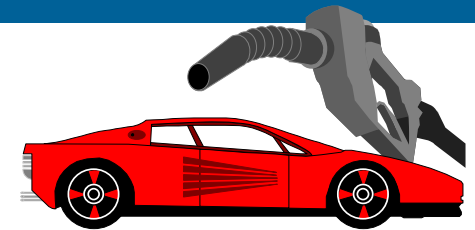
(aircraft, car, lorry and bus washing plants etc.)



PE Applications

AMIANTIT PIPE SYSTEMS

- **Filling stations**
(diesel, petrol, and other fuels)



- **Domestic vacuum cleaning systems**
(cleaning of office buildings, apartment houses and large buildings etc.)



- **Water systems for sport stadiums**
(irrigation, artificial snow, indoor sport facilities etc.)



PE Applications

AMIANITIT PIPE SYSTEMS

- **Piping systems for bridges**
(to cover electricity and telecommunication cabling as well as the transport of gas, water and other media)



History of HDPE

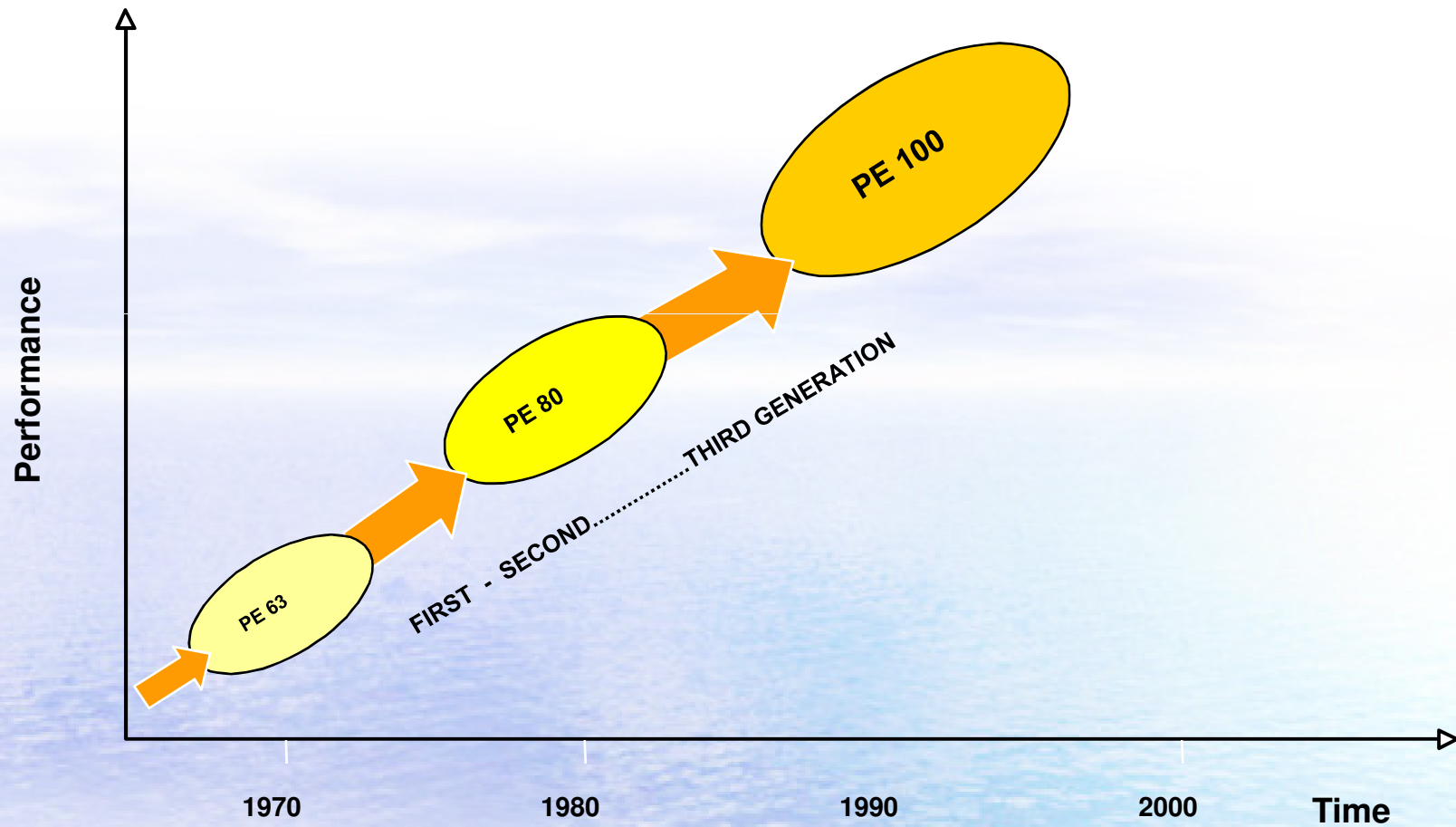
History of Plastics

AMIANITIT PIPE SYSTEMS

Type of plastic	Abbreviation	First produced	Density	Design hoop stress at +20°C	Pipe diameter
			kg/m ²	(MPa)	(mm)
Polyvinylchloride	PVC-C	1935	1,400	10.0 - 14.0	40 - 630
Polyethylene	LDPE	1945	930 - 940	2.5 - 3.2	16 - 160
Polyethylene	HDPE	1955	950 - 965	5.0 - 6.3	25 - 1,600
Polypropylene	PP	1955	910 - 925	5.0*	25 - 1,200
Polybutylene	PB	1955	920	5.0*	25 - 160
Polyethylene	PEX	1968	930 - 965	5.0*	25 - 160
Polyethylene	MDPE	1971	940 - 950	5.0 - 6.3	25 - 1,600
Polyethylene	LDPE	1986	935 - 940	5.0	16 - 160
Polyethylene	HDPE100	1990	950 - 965	8.0	2.5 - 1,600

PE100 The Third Generation of Polyethylene

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Technical Terms of HDPE

Definitions and Concepts

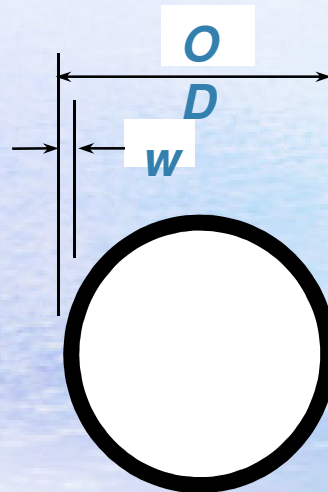
Definitions and Concepts

AMIANITIT PIPE SYSTEMS

Standard Dimension Ratio (SDR):

The ratio between the outside diameter (OD) and the wall thickness

$$\text{SDR} = \frac{\text{nominal outside diameter}}{\text{nominal wall thickness}}$$



Definitions & Concepts (Cont.)

AMIANTIT PIPE SYSTEMS

SDR	26	21	17	13.6	11	9
PE-80	PN 5	PN 6	PN 8	PN 10	PN 12.5	PN 16
PE-100	PN 6.3	PN 8	PN 10	PN 12.5	PN 16	PN 20

Definitions & Concepts (Cont.)

AMIANITIT PIPE SYSTEMS

Minimum Required Strength (MRS)

The Level of the Minimum Required Strength (MRS), in MPa, at 50-years and 20°C is specified / certified by the raw material suppliers.

- For PE – 80, MRS = 8 MPa (80 Bar)
- For PE – 100, MRS = 10 MPa (100 Bar)

Maximum Allowed Design Stress (σ_s):

“ σ_s ” is the Maximum Allowable Design Stress for a given application. It is calculated as follows:

$$\sigma_s = \text{MRS} / 1.25$$

Classification of Polyethylene LDPE / MDPE / HDPE

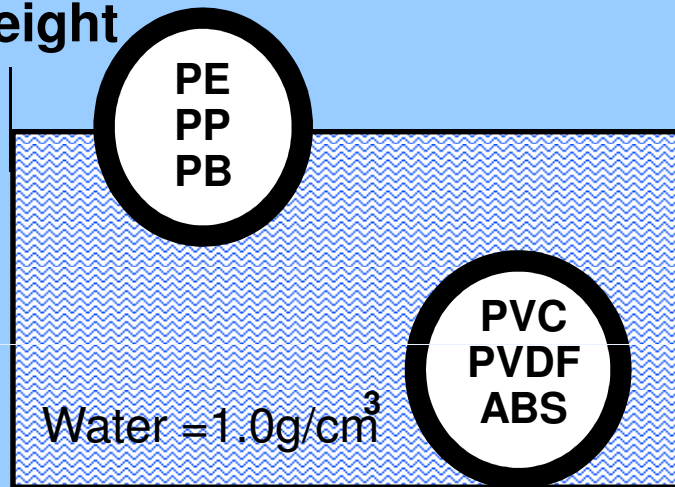
AMIANITIT PIPE SYSTEMS

MRS MPa	Material types
6.3 -7.99	PE 63
8.0 -9.99	PE 80
10.0 -11.19	PE 100

Properties of typical plastic pipeline materials

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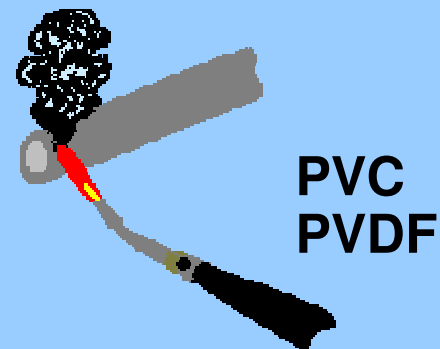
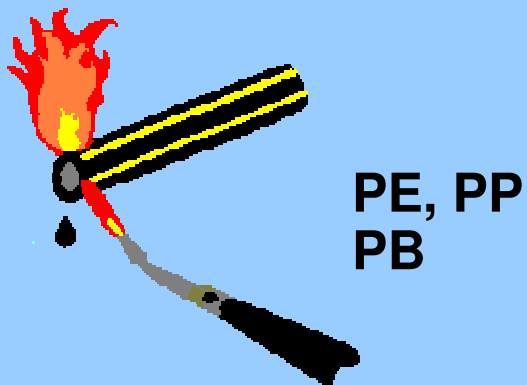
Weight



Density

PP	= 0.91 g/cm ³
PB	= 0.93 g/cm ³
PE	= 0.93 g/cm ³
ABS	= 1.03 g/cm ³
PVC	= 1.38 g/cm ³
PVDF	= 1.78 g/cm ³

Behaviour to heat



Product Range

Product Range

AMIAANTIT PIPE SYSTEMS

For HDPE Solid Wall Pipe:

- **Diameter Range:** 16mm - 630mm.
- **Pressure Range** Up to 16 bar.
- **Special Pipes** up to 32 bar
- PP solid wall pipes – on request.

For PP Corrugated / Profile Wall Pipe:

- **Diameter Range** 200mm -1000mm.
Gravity Application.
Minimum Stiffness 8000 Pa.
- **HDPE Corrugated pipes** – on request.



Product Range (Fittings-Cont.)

AMIAANTIT PIPE SYSTEMS

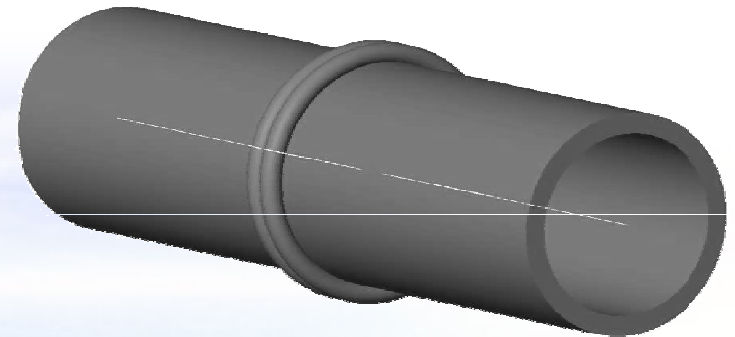
- Mitered, segment welded fittings, Tees / wyes / crosses/ Elbows.
- Socket Welding Fittings.
- Injection molded fittings, such as flanges, reducers , and unequal tees/wyes are sourced out from international reputable suppliers.
- Manhole Connections, Air & Wash Valve Fittings.
- Mechanical Couplings (repair) & Fittings (Compression).
- Electro-fusion fittings & Couplings
- Saddles



Joining Systems (HDPE)

AMIAANTIT PIPE SYSTEMS

- But-fusion welding (standard)
- Electro fusion
- Flange connections
- Mechanical joints



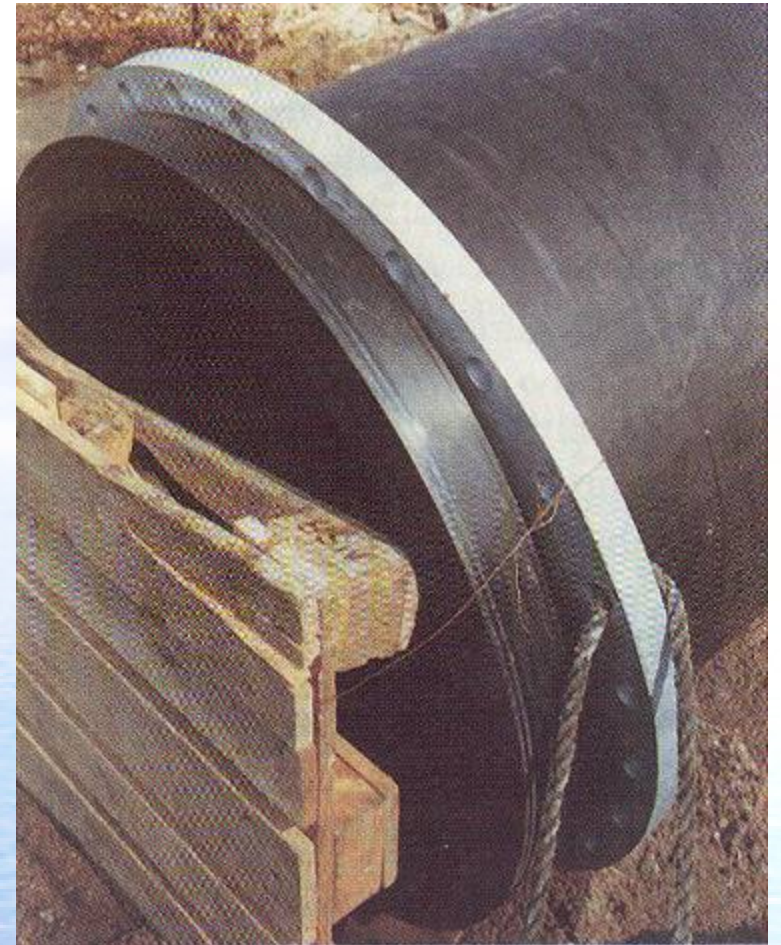
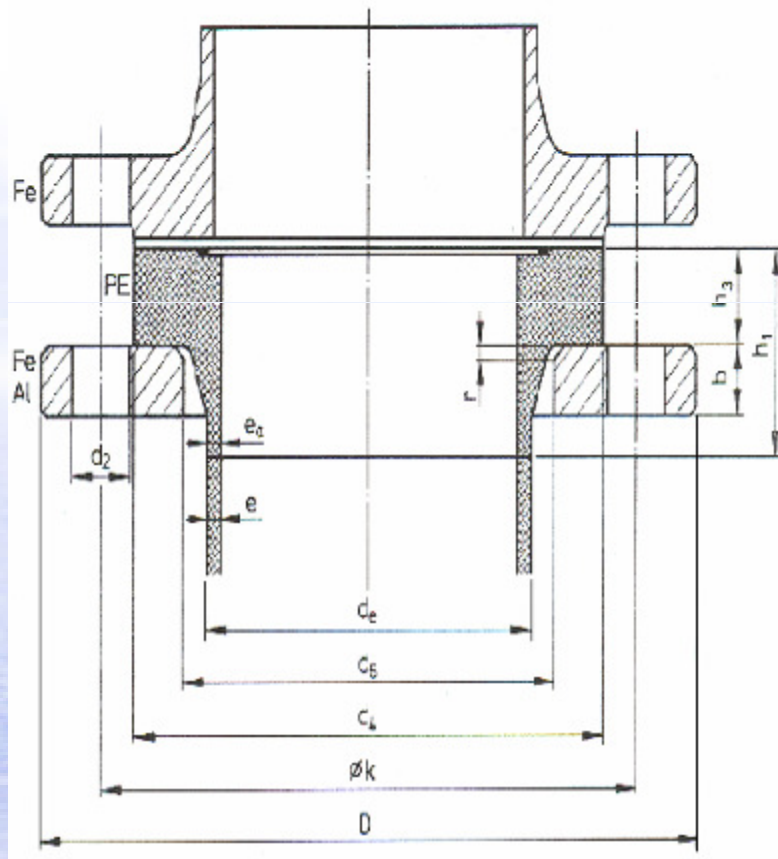
Electro-Fusion Joint-Fitting

AMIAANTIT PIPE SYSTEMS



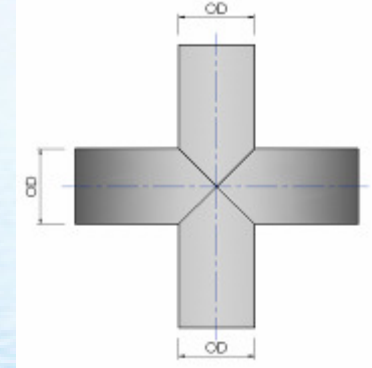
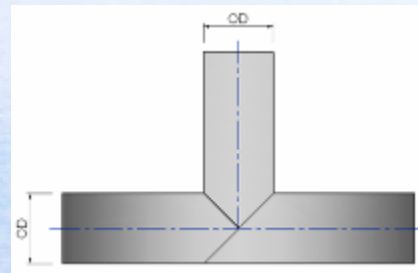
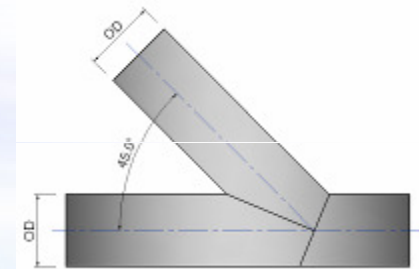
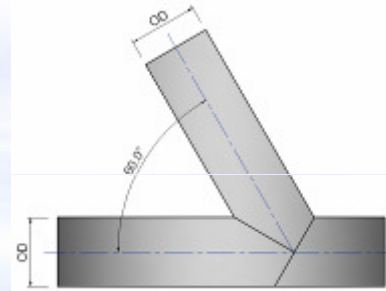
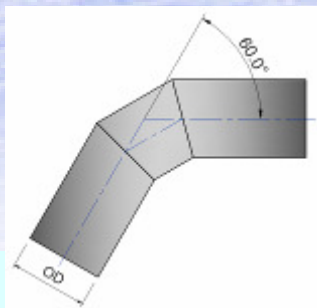
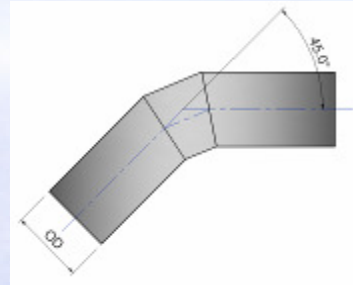
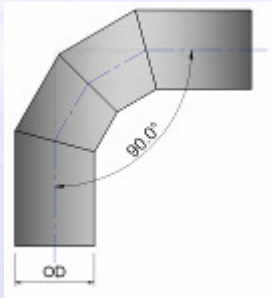
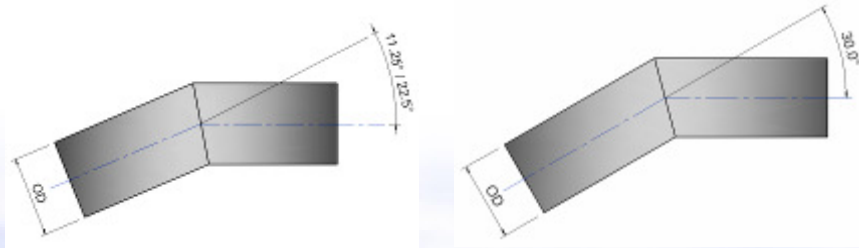
Flange connections

AMIANTIT PIPE SYSTEMS



But-fusion welding (standard) & Fittings Segmented

AMIANITIT PIPE SYSTEMS



Capacity Available

The Plant

AMIAANTIT PIPE SYSTEMS



Amiantit Pipe Manufacturing Co. Ltd.

PE PLANT - PHASE I



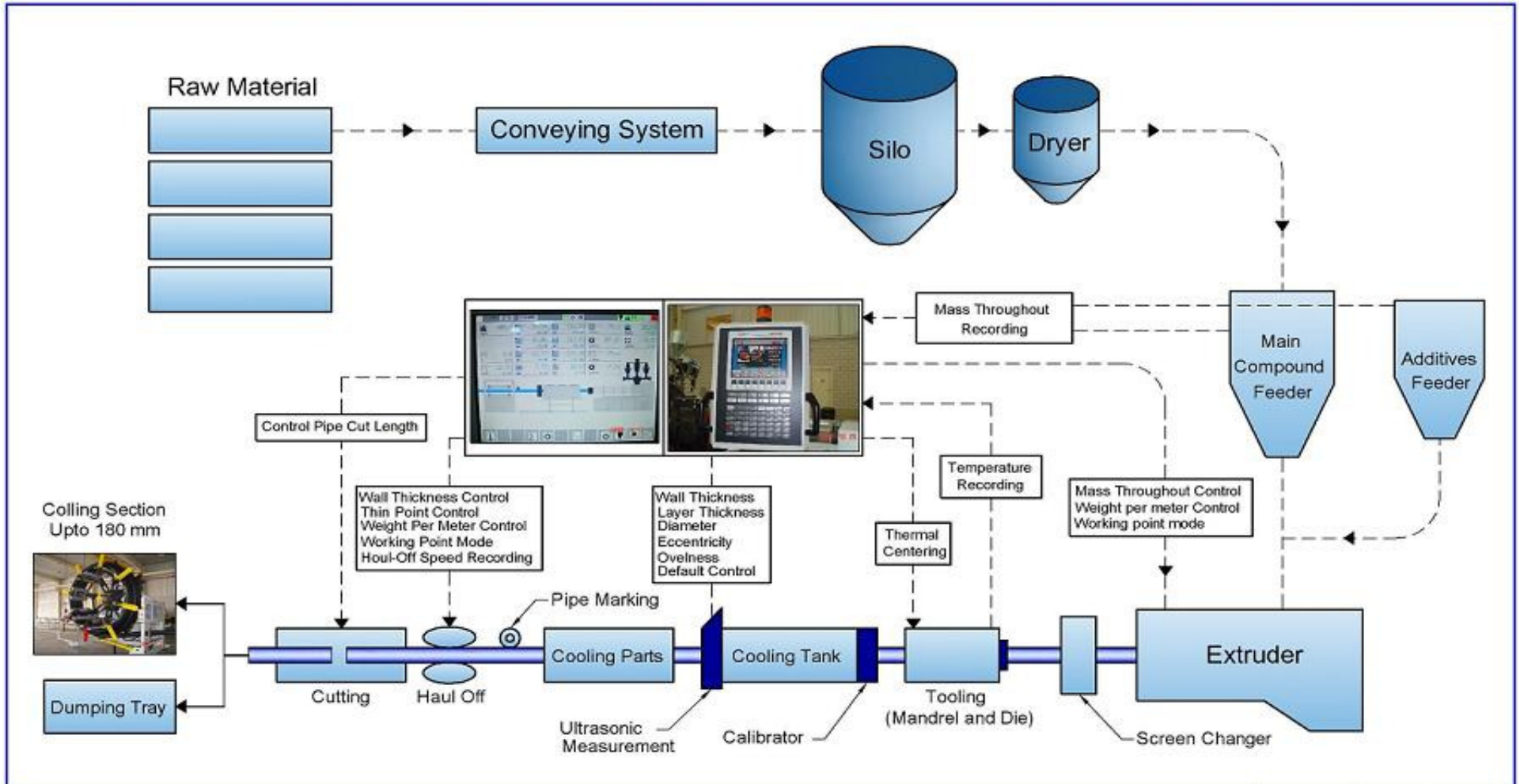
TYA & Associates

Location: South Jeddah – Al-Khomra

Total area: 120,000 m² Covered area: 15,000 m²

Fully Automated Manufacturing Process

AMIAANTIT PIPE SYSTEMS



APPSCO PROCESS FLOW CHART

APSCO
Amiantit

Manufacturing Process (Cont.)

AMIANITIT PIPE SYSTEMS

Closed Raw Materials
Conveying System to
ensure Purity & to
control Material
Moisture.



Plant Capacity

AMIANITIT PIPE SYSTEMS

**Extended plant capacity
to satisfy customers needs**

620 Km/year

15000 Ton/Year Solid Wall

4000 Ton/Year Corrugated

**Ability to double the capacity with future
expansion**

Plant Capacity

AMIANTIT PIPE SYSTEMS



Finally New Line is Added in Jan 2010

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Manufacturing Process

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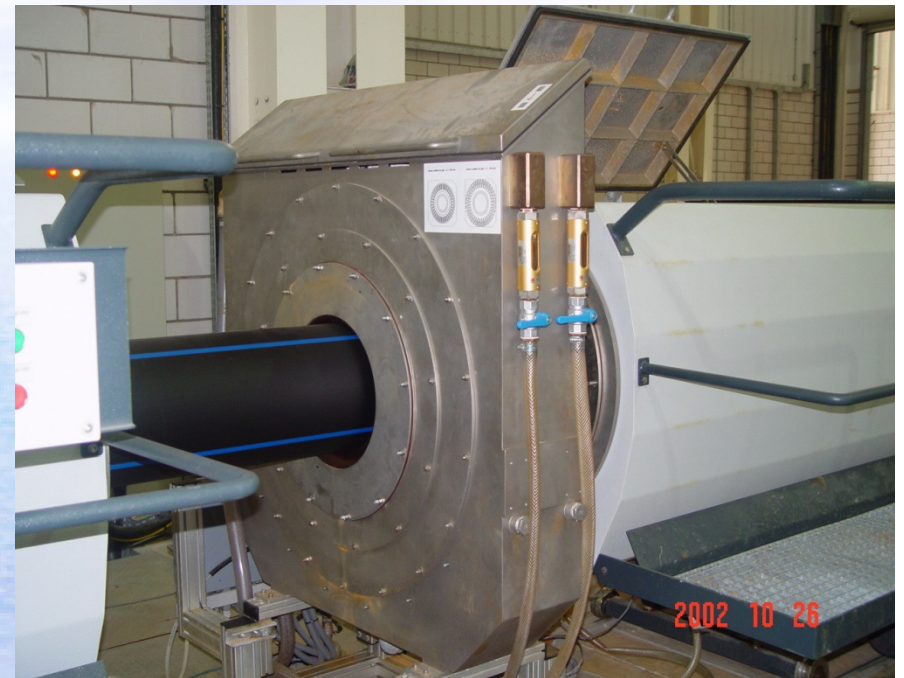
Fully automated extrusion lines to ensure consistent high quality products.



Manufacturing Process (Cont.)

AMIANITIT PIPE SYSTEMS

Ultrasonic Measuring with Gravimetric Weight Control Combined Systems to ensure uniform pipe dimensions (Thickness & OD) automatically during production



Manufacturing Process (Cont..)

AMIAANTIT PIPE SYSTEMS

Pipes can be supplied with standard lengths or coils to reduce installation time and cost

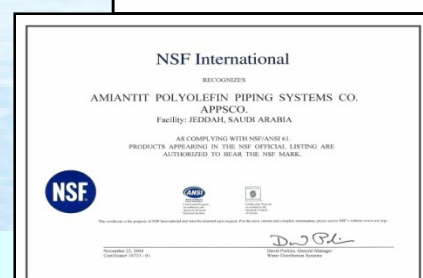
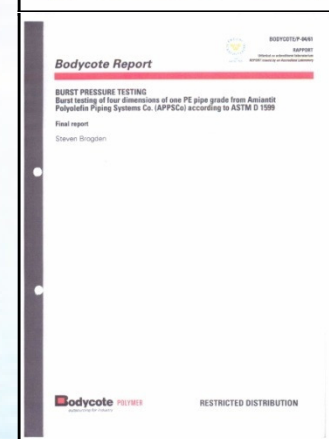


Q.A. & Q.C. CERTIFICATIONS

AMIANTIT PIPE SYSTEMS

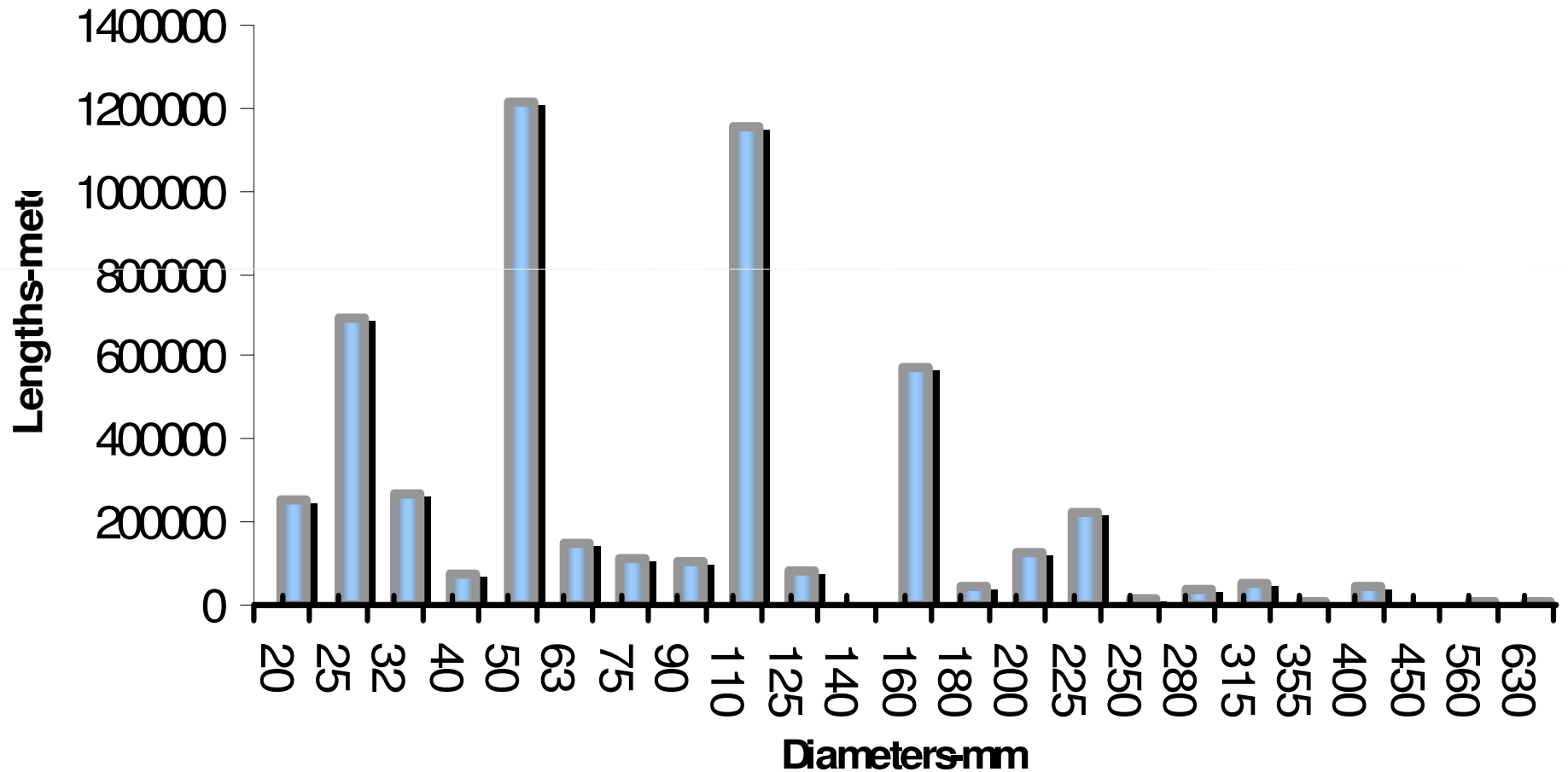


- ISO 9001/2000 QMS certified company (TUV).
- Fully equipped on-line lab facility with all testing required, certified Lab by Certification Body to meet the ISO 4427 & EN 13476-1.
- Having Attestation (Certificate of inspection) on meeting the relevant test methods.
- Control Calibration for all plant QC and Plant tools.
- NSF Approved pipes for drinking water.
- Burst Test by Bodycote Testing. Testing of four dimensions @ SIX Different Temperatures for each dimension (30, 40, 45, 50, 55, 60°C) in accordance with ASTM D1599.
- On going FM approval for Firefighting.



Total Production 5,238,601 m

AMIAANTIT PIPE SYSTEMS



Total Production 5,238,601 m

AMIANITIT PIPE SYSTEMS

OD (mm)	Length (m)
20	253,000
25	693,315
32	268,375
40	73,285
50	1,213,772
63	145,292
75	115,090
90	106,000
110	1,154,314

OD (mm)	Length (m)
125	79,928
140	875
160	576,747
180	45,285
200	128,518
225	221,202
250	12,822
280	36,340
315	52,281

OD (mm)	Length (m)
355	3,821
400	45,609
450	1,002
560	5,578
630	6,150

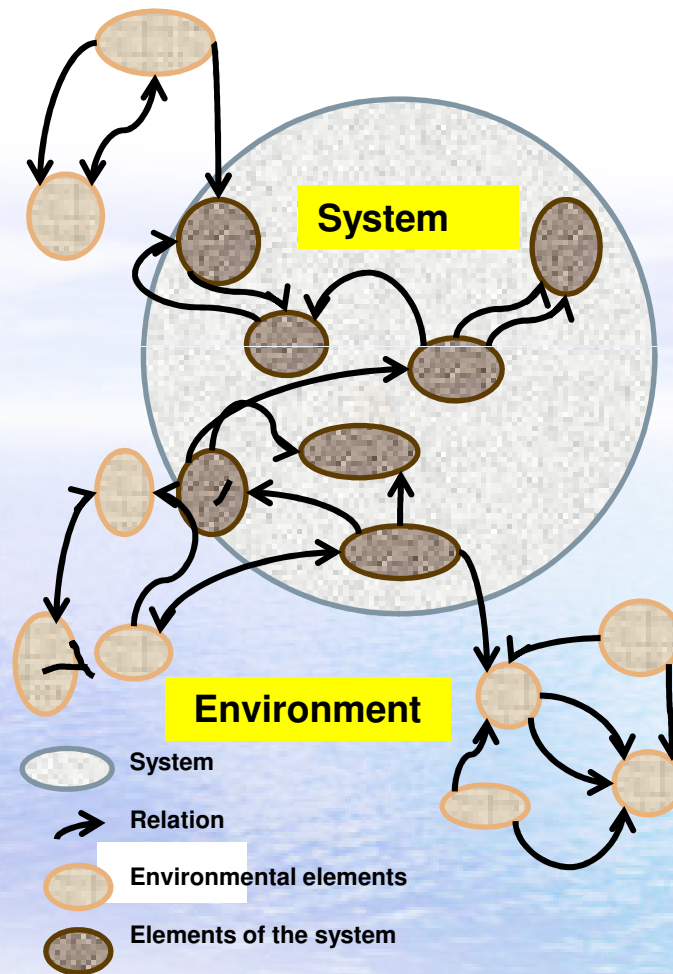
Caution in Specifying HDPE

Caution in Specifying HDPE

AMIANITIT PIPE SYSTEMS

Environment Effects:

- Mechanical Actions
- Thermal Effects
- Chemical Effects
- Biological Factors
- Long-term Effect
(Ageing Factors)



Systems Effects

- Pipe, Flanges, Fittings
- Bolting, Gaskets
- Valves
- Hangers and Supports
- Insulations,
Coverings, Coatings
- Heat Tracing

AMIANITIT PIPE SYSTEMS

Material Factor

- Resins
- Masterbatches
- Manufacture process

Pipe lifetime

Environmental Factor

- Water Temperature
- Outside Temperature
- The quality of Water or Gas
- Environmental Attack

End-user Factors

- Culture
- Installation Cond.
- Special application

Caution in Specifying HDPE

AMIANITIT PIPE SYSTEMS

- HDPE is sensitive to Temperatures
- Nature of the fluid
- Need to study All parameters
- Then make proper study of Systems
- Specify your requirements in Specs
- Ensure proper manufacturing
- Ensure qualified welders and Installers
- Consult Manufacturer all the times

Conclusions

Conclusions

AMIANITIT PIPE SYSTEMS

- ☐ HDPE is Thermo Plastic Material
- ☐ HDPE provides lot of flexibilities
- ☐ This can be used in variety of piping applications
- ☐ Caution need to be exercised to make appropriate specifications - Key of successes
- ☐ Manufacturer shall be selected properly
- ☐ Capacities are available in KSA

**Thank you
Questions and Answers**

AMIAANTIT PIPE SYSTEMS

