

**TNTRE**

# PRESENTATION ON HIGH DENSITY POLYETHYLENE [HDPE] PIPES FOR FLUID CONVEYANCE

- TNTRE**
- All About Resin
  - Manufacturing Process
  - Quality Assurance Tests
  - Relevant Standards
  - Advantages Of PE Pipes
  - Jointing Of PE Pipes
  - Installation Of PE Pipes
  - Repairs & Maintenance
  - Factors Influencing Performance
  - Application Of PE Pipes
  - HDPE Pipes : Techno Economic Solution For Fluid Conveyance
- 

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PE(Polyethylene) : Member of Polyolefin's series categorized based on density:  
 HDPE  
 LDPE  
 LLDPE

Further categorized as :  
 PE63  
 PE80  
 PE100

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| Material Grade | Minimum Required Stress <sup>1</sup> | After Safety Factor Correction <sup>2</sup> | Temp. Correction <sup>3</sup> |
|----------------|--------------------------------------|---|-------------------------------|
| PE63           | 6.3                                  | 5.0   | 4.0                           |
| PE80           | 8.0                                  | 6.3   | 5.0                           |
| PE100          | 10.0                                 | 8.0   | 6.3                           |

ISO Standard     BIS Standard


<sup>1</sup> 20° C – 50 year life  
<sup>2</sup> with 1.25 safety factor  
<sup>3</sup> with temp. of 30°C and 50yr life

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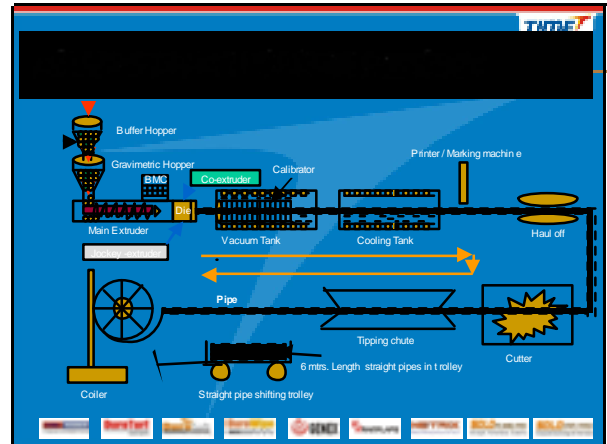
Minimum Wall thickness of various grades of Pipes  
all PN 10 (10 Kg/scm rated)

| OD  | PE 100 | PE 80 | PE 63           |
|-----|--------|-------|-----------------|
| 90  | 6.7    | 8.2   | <del>10.0</del> |
| 110 | 8.1    | 10.0  | <del>12.3</del> |
| 160 | 11.8   | 14.6  | <del>17.8</del> |

Higher ID  
More flow  
area




GENCO, Sankuland, HPT, HPS, HPS, HPS, HPS, HPS



**TNTRE**

- o IPCR TEST(Hydro static Test)
- o Reversion Test
- o Carbon Dispersion Test
- o M F I Test
- o Dimensions Check



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- o Fusion compatibility ISO 11647
- o Butt Fusion Cycle ISO 11414
- o Butt Fusion Machines ISO 12176
- o High Density Polyethylene for Water Supply IS 4984-95
- o HDPE pipes for Sewerage IS 14333
- o Polyethylene Pipes for Water Supply EN 12201:2
- o Mechanical Joints for PE pipes ISO 14236
- o Code of practice for Plastic Pipe Installation & testing IS 7634-II

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**LIGHT IN WEIGHT**





**EASY TO TRANSPORT & HANDLE**

**Low Friction Factor: C=150**  
Saves Power

**High Impact Strength**  
Practically Unbreakable  
Do not dent or crack due to land slide, soil movement  
1995 earth quake only Polyethylene pipe survives



**FLEXIBLE ,RESILIENT**




- Minimum requirement of bends
- Can be laid on undulated terrains
- Ideal for sub marine lines

**WIDE OPERATING TEMPERATURE RANGE : -40 to 60 Deg C**

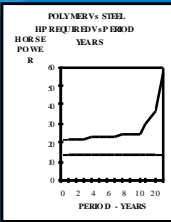
- Ideal for sub zero temperature conditions




**Energy saving – No corrosion & incrustation**

**Steel – Pumping cost increases with age**



| PERIOD - YEARS | STEEL HP REQUIRED | POLYMER HP REQUIRED |
|----------------|-------------------|---------------------|
| 0              | 15                | 15                  |
| 2              | 15                | 15                  |
| 4              | 15                | 15                  |
| 6              | 15                | 15                  |
| 8              | 15                | 15                  |
| 10             | 15                | 15                  |
| 12             | 25                | 15                  |
| 14             | 35                | 15                  |
| 16             | 45                | 15                  |
| 18             | 55                | 15                  |
| 20             | 60                | 15                  |



> Pumping mains: high water hammer resistance compared to other rigid pipes

|         |               |
|---------|---------------|
| ○ HDPE  | 800-1200      |
| ○ PP-b  | 1200-1500     |
| ○ PVC   | 3000-3500     |
| ○ GRP   | 10,000-20,000 |
| ○ Steel | 210,000       |

Wave velocity =  $\sqrt{\text{Mod. Elasticity}}$

Lower modulus – lower water hammer raise

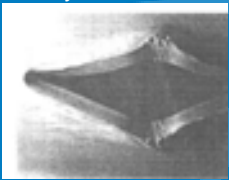

### Surge Pressure Raise

| Pipe Material | Working Pressure   | Raise in Wave Speed at 1.5m/sec linear velocity | Surge Pressure - Raise | Total Maximum System Pressure |
|---------------|--------------------|---|------------------------|-------------------------------|
|               | Kg/cm <sup>2</sup> | m/sec   | Kg/cm <sup>2</sup>     | Kg/cm <sup>2</sup>            |
| 8" HDPE       | 7                  | 218   | 3.4                    | 10.4                          |
| 8" DI         | 7                  | 1194  | 18.7                   | 25.7                          |
| 12" HDPE      | 7                  | 218   | 3.4                    | 10.4                          |
| 12" DI        | 7                  | 1194  | 18.0                   | 25.0                          |

The raise in Water Hammer surge in Pumping mains is 2.3 times more in DI than PE under the same conditions



**Only Ductile failure design possible**

Ductile
Brittle

An Advantage - no other material construction in Water and Sanitation sector can offer You!

**>Leak Proof Joints**

Joining Methods

| PERMANENT   | DETACHABLE  |
|---|---|
| <ul style="list-style-type: none"> <li>○ Butt Fusion using a heating mirror -most economical</li> <li>○ Electro-fusion</li> </ul> | <ul style="list-style-type: none"> <li>○ Flanged</li> <li>○ Compression Fittings</li> </ul> |

Wide Choice – depending on Cost Benefit analysis

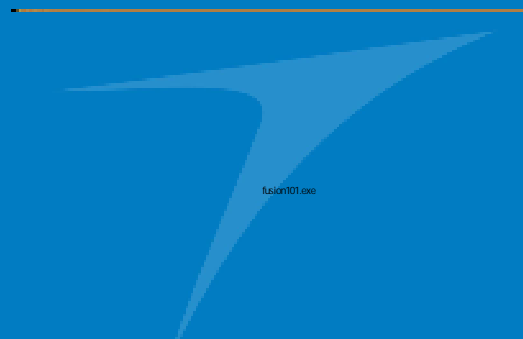
**Typical application**

- Connecting large pipe diameters
- Utilities (water & gas)
  - Industrial, Drainage / Sewage
  - No-dig
- Main advantage:
  - Sizes up to 1600 mm
  - No additional components
  - High integrity welded joint





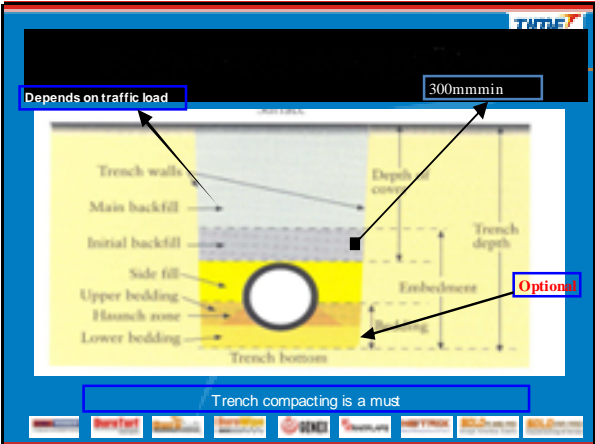
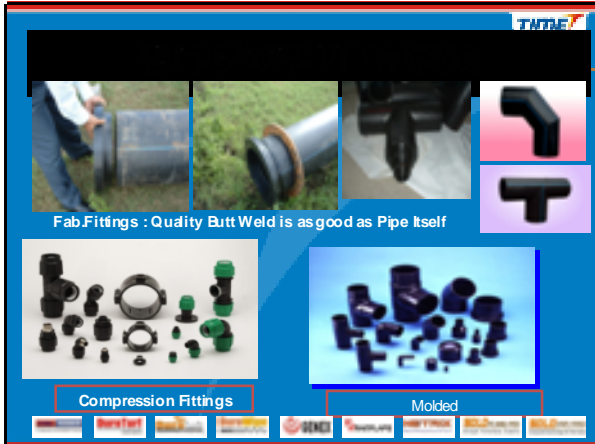




fusion01.exe



- o But welding:
    - o Most economical
    - o Require skill – joints surface area small (only wall, thick)
    - o Large dia – yet no alternative
    - o But Good machines are available with minimal human intervention
  - o Electro-fusion
    - o Only upto 500mm
    - o Fittings very expensive (not easily available)
    - o But ideal for repairs and critical applications
    - o For Tees – most recommended
  - o Compression Fittings
    - o Only upto 110mm
    - o Costly, but for called pipes – easy to fix
    - o Ideal for flanged joints and maintenance
    - o Many choice in suppliers
- Each situation requires a unique decision on jointing



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Flanged Spool

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Replacement with Flanged Spool

Replacement Using Electrofusion or Fully Restrained Mechanical Coupling

Flanged Spool

Mechanical coupling

- While fixing Valves to PE pipes
  - Ensure that the wheel locking torque does not come off to the collar
  - Adequate support should be given - especially to Flange Joints - No sagging!
  - M/S/D Tees can also connected for a tapping - e.g. for pipes in indicator connection etc

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- Resin
- Compounding methods and Master Batches.
- Carbon Black Dispersion
- Processing Hardware
- Cooling Trough length and residence time for cooling- very important - especially for large wall thickness pipes
- Pipe Design factors
- Joining methodology
- Fittings used
- Laying and Testing

Every Aspect is important

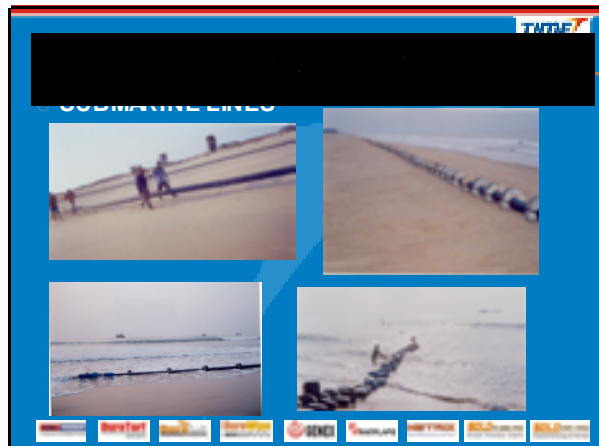
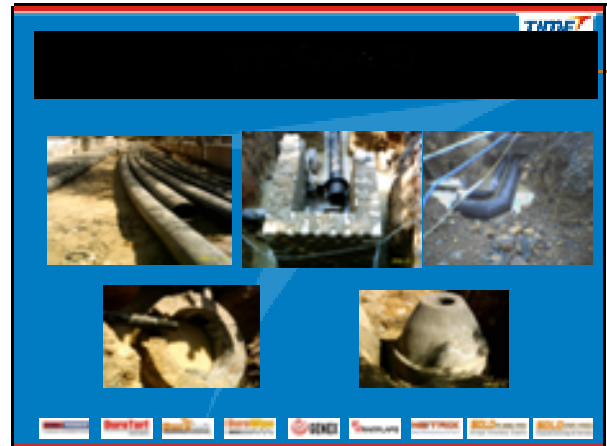
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# APPLICATIONS OF HDPE PIPES

**WATER SUPPLY: RISING MAINS & DISTRIBUTION NETWORK**

The diagram illustrates the water supply process. It starts at a 'Source' (represented by a house icon), moves to 'Water treatment' (represented by a factory icon), then to 'Water storage' (represented by a tank icon). From there, it goes to 'Water distribution' (represented by a house icon with a tank on top). 'Water service lines' lead from the distribution point to individual houses. 'Waste water' is shown as a separate line leading to 'Waste water treatment'. A pink circle highlights the 'PE's area of Operation' which encompasses the water storage tank, distribution point, and service lines.

Source, Water treatment, Water storage, Water distribution, Water service lines, Waste water, Waste water treatment, PE's area of Operation



**EFFLUENT DISPOSAL, INPLANT PIPING**

Two photographs showing industrial piping and effluent disposal. The left photo shows a large pipe with a red valve. The right photo shows a large pipe with a red valve.



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- Hydrotransport of solids
  - Ash, Ore Slurry transportation
  - Sand Stowing in coal mines
  - Dredging
  - Highway Crossings

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| APPLICATION  | PE | PVC | M.S. | D.I./C.I. | R.C.C. |
|--------------|----|-----|------|-----------|--------|
| WATER SUPPLY | Y  | Y   | Y    | Y         | Y      |
| EFFLUENT     | Y  | N   | N    | Y/N       | N      |
| DREDGING     | Y  | N   | N    | N         | N      |
| SLURRY       | Y  | N   | Y/N  | Y/N       | N      |
| SUBMARINE    | Y  | N   | N    | N         | N      |
| SEWAGE       | Y  | N   | Y    | Y         | Y      |
| GAS          | Y  | N   | Y    | N         | N      |

PE PIPES FOR ANYTHING THAT FLOWS

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- Availability of wide range of sizes and working pressure classes :
- Telescopic design of pipeline possible

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- THANK YOU
- FOR YOUR
- KIND ATTENTION & TIME

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