NOT JUST PIPES - PERFECTION !

One of the many ways we can tell you about the incredibly broad spectrum of products, applications and solutions, the GreenAgri HDPE Pipes' Division can provide you with is, if you will please -

TURN THE PAGES

Technical Manual

You may Wonder !
What GreenAgri HDPE Pipe are doing at 17,000 feet in Sikkim in Eastern Himalayas ?

When we have such a broad range of products for various applications
With perfect solutions-delivered anywhere, with over 100 years guaranteed Life –
You can well say that we are at the peak of performance with perfection –
Fulfilling the needs of millions of Clients like you.

GreenAgri POLYPLAST

Total Solution Provider

GreenAgri the Pioneer & leader of manufacturing quality PE piping systems, has been able to evolve its global presence with state-of-art and his mission was "leave This world Better than you Found it". Towards this mission, he took up conservation of water, energy and environment and all the all the products he started manufacturing for the systems are aimed towards the conservation of the most important things for humanity today. with years of engineering, design, manufacturing, installation, operation & Maintenance experience and a unique culture of innovation, the GreenAgri has forged ahead as the global leader for PE piping system. GreenAgri has many success stories to its credit. It has manufactured 1st time in India the OFC PE ducts lined with silicon, 315mm diameter HDPE pipes and fittings. These large diameter HDPE pipes and fitting are typically used for sea water intake and brine water outfall submarine lines for desalination plants, thermal power plant in-plant piping systems, river water infiltration galleries of canal by underground piping systems, effluent and chemical conveyance systems.

GreenAgri also offer complete services for HDPE piping systems on turn-kry basis which includes site survey, design, selection of material, supply, installation, testing and training, operation and maintenance in most economical way supported by a large pool of engineers. GreenAgri has successfully executed many turn-key projects form concept to commissioning.

The demand for clean water is a big challenge to the municipalities worldwide. As cities continue to expand the demand for cost-effective water supply and distribution becomes important. The concept of sustainable cities is achieved using effective & efficient water supply & distribution systems to end users through leak proof pipe network (using HDPE pipe & fittings) which is always full of water and with a positive pressure so that user may draw the water 24 hours a day & 7 days a week.

In water supply system the objective of safe, reliable and affordable water supply is achieved using efficiently managed water supply & distribution arrangements. Over the years, the experience shows that these objectives are difficult to achieve and sustain, using conventional water supply distribution networks with intermittent water supply. The continuous water supply (24 X 7) with constant end pressure is the most appropriate way to achieve the objective of SMART cities in INDIA for saving precious water depleting fast at the sources.

The 24 X7 scheme can ensure quality of water for public health, uninterrupted water supply at desired pressure, reduction of water consumption by 30 to 50 %. The success of 24X7 schemes lies in choosing the right pipe M.O.C. the water distribution network requiring leak-proof joints with maintenance free pipe system with a life span of 100 years can be achieved only using pipe made of Polyethylene (PE) material.

The quality GreenAgri products, services and system is assured by EGAC approved in-house R & D laboratory and accredited by ISO 9001 : 2015.

GreenAgri has also ushered in the new concept of large scale integrated Irrigation projects along with 24X7 water supply projects.

GreenAgri PE Pipe - Application

Irrigation manufactures PE Pipe and Fittings which are widely accepted in following applications.

Municipalities, Corporations and Public Utilities

- Pumping Mains for Water
- Potable Water Distribution System
- House Service Connections
- Waste Water Treatment Plants.
- Aeration and Odour Control Ducting
- Landfill - Leachate Collection & Conveyance
- Landfill - Methane Gas Extraction & Convenyance

Sewerage

- Pumping Main for Sewerage
- Force Main for Sewer
- Gravity Main for Sewer
- Rehabilitation of Sewer Lines

Irrigation & Agricultural

- Rising Main & Distribution Systems
- Lift and Gravity Irrigation
- Drip Irrigation
- Gated Pipe Irrigation
- Sprinkler Irrigation
- Sub Soil Drainage
- Aquaculture
- Canal Replacement

Industrial

- Pulp & Paper
- Chemical Process Lines
- Corrosive Liquids
- Effluent Disposal
- Building & Construction
- Fertilizers
- Food Processing Industry
- Marine Intake and Outfall
- Salt Pan
- Fire Fighting Systems
- Material Handling - Pneumatic Conveyance of Particulates
- Fly-Ash Slurry and others

Mining Industry

- Leach Lines
- Coal Decant Systems
- Mine Drainage
- Coal Tailings
- Slurry and Sludge Transport
- De-watering
- Dust Suppression
- Sand Stowing

Infrastructure

- Untreated and Treated Effluent
- Stay Cable Pipe for Cable Stayed Bridges
- Desalination Plant
- Culverts and Storm Water Drains
- Thermal & Nuclear Power Station
- Hydel Power Plants
- Dredging & Sand Stowing
- Infiltration Gallery

Gas & Air

- Natural and LP Gas Distribution
- Coal Bed Methane Gas Collection & Distribution
- Air: Chilled air conveyance
- Bio-gas conveyance
- Inert gas conveyance (argon, nitrogen, helium)

Ducting

- Electrical Cable Ducting
- Telecommunication Cable Ducting
- Optical Fibre Cable Ducting
- Micro Duct - House Connections


Strength Always Matters!

Material Properties of PE

Material Grade

As per conveyed fluid temperature two material grades are available

1) PE (PolyEthylene) Grade
2) PERT (PolyEthylene of Raised Temperature resistance) Grade

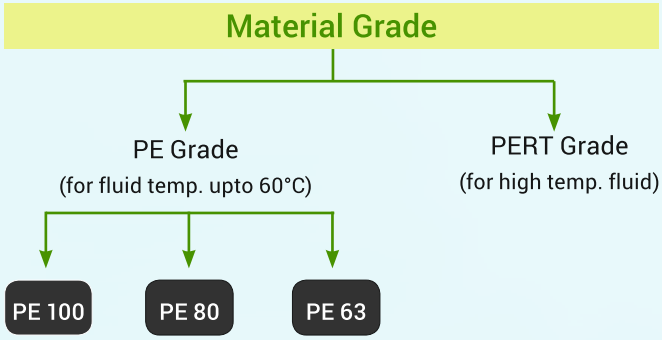
Basically PE Material is suitable for conveying fluids at ambient temperature and the Indian Standard is based on design temperature of 30°C (Indian ambient temperature). However, PE grades 63, 80 and 100 can be used up to 60°C with suitably degrading pressure class as per chart and graph given in the standards.

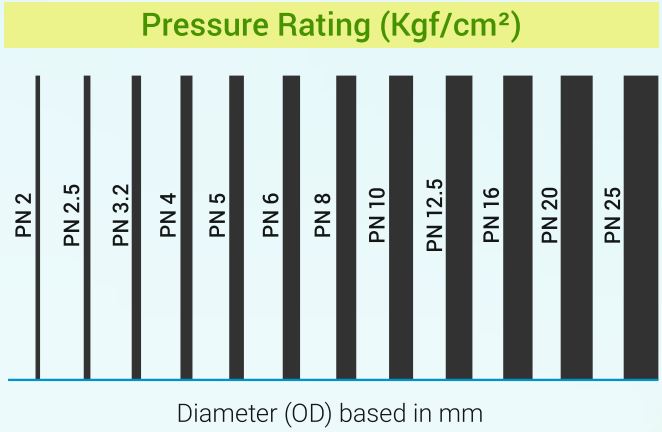
For conveying fluids of elevated temperature (say 70°C), PERT materials grade is recommended for pipes and fittings.

Material properties for PE and PERT are given below.

PE grade

The standards give the PE pipe raw material grades as PE63, PE80 and PE100.The PE raw material is manufactured in the form of granules and the first generation grades of PE63 & PE80 raw materials were manufactured by UNIMODEL method. Subsequently PE100 grade was introduced with BIMODEL method of manufacturing, the PE80 grade also was included in the BIMODEL method. This BIMODEL method of manufacturing the PE granules both in PE 80 and PE 100 grades, improved not only the Minimum Required Strength but also the pipe performance by increasing the Notch Resistance as well as Resistance to Crack propagation. The increase in MRS also reduced the wall thickness for a given pressure class thereby increasing the internal diameter resulting in better fluid flow with reduced cost of pipe.





Pipe Size: 20, 25, 32, 40, 50, 63, 75, 90, 110, 125, 140, 160, 180, 200, 225, 250, 280, 315.

The PE Raw Material Resin granules is available in two types:

1. Natural grade which is translucent and for the UV protection Carbon black master batch is added to the granules during extrusion.
2. Pre-compounded resin granules are also available which is specified in all the International Standards which gives a uniform dispersion of carbon black in the end products thereby the products have better UV resistance for long storage under sunlight or for above ground installations.

Natural grade PE Resin with Master Batch Carbon black granules.

Pre-compounded PE black granules.

The pipes are classified according to the material grade and pressure rating as per the details given below

PE pipes are manufactured conforming to Indian standards below

1) Indian Standards : IS-4984
2) International Standard : ISO-4427
ISO-4437

Mechanical and Physical Properties of Raw Material

Property	Value	Unit
Density (Base Material)	940– 965	Kg/M³
Melt flow index (190°C /5.0 Kg)	0.2 – 1.1	g /10 Minutes
VST	120 - 130	°C
Crystalline melting Range	130 - 133	°C
Viscosity Number	390	Cm³/g
Hardness	56 - 65	Shore " D"
Tensile Strength at Yield	20 - 26	MPa
Ultimate tensile Strength	30	MPa
Elongation At Break	>600	%
Elastic Modulus	800 - 1200	MPa
Flexural Stress (3.5% Deflection)	13.8 – 20.3	MPa
Charpy Notched Impact at 0°C	16	KJ/M²
Thermal Stability at 210°C	≥15	Minutes
Carbon Black Content	2 - 3	%

PE Pipe Wall Thickness for raised temperature

The wall thickness of pipes are based on the maximum allowable hydrostatic design stress at 30°C water temperature for 50 years of life. In case of variation in water temperature, the working pressure needs to be modified as per given chart. However, occasional rise in temperature as in summer season with concurrent corresponding reduction in temperature during night has no deleterious effects on the life and working pressure of PE pipes.

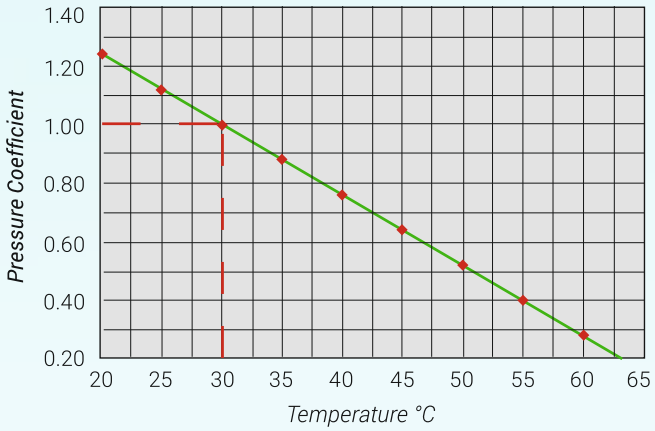
Mechanical and Physical Properties of PE Pipe

Property	Value			Unit
Base density	930 to 960			Kg / m³
MFR @ 190 Deg.C and 5 kg load	0.2 to 1.1			g / 10 min
Longitudinal Reversion Test	≤ 3			%
Carbon Black content	2.0 to 3.0			%
Carbon Black dispersion	Satisfactory dispersion			-
Anti-oxidant content in PE resin	Max 0.3			%
OIT of PE resin and Pipe @ 200 Deg.C	> 20			Minutes
Volatile content of PE resin	≤ 350			mg / kg
Water content of PE resin	≤ 300			mg / kg
Dimensional characteristics	As per IS 4984–2016			-
Hydraulic characteristics	PE63	PE80	PE100	-
27 Deg.C & 100 hrs Duration	6.9	8.6	10.7	MPa for
80 Deg.C & 48 hrs Duration	3.8	4.9	5.7	Induced
80 Deg.C & 165 hrs Duration	3.5	4.5	5.4	stress
80 Deg.C & 1000 hrs Duration	3.2	4.0	5.0	selected
Tensile strength of Butt fusion joint	Ductile failure			-
Elongation at break	≥ 350			%
Slow crack growth at 80+1 Deg.C, notched test specimen at below internal test pressure (Bar)	≥ 500			Hrs.
PE63 6.4 / PE80 8.0 / PE100 9.2				

Temperature vs Pressure Co-efficient Chart

Temperature De-rating of PE Pipes (as per IS: 4984-2016 specifications)

Service Temperature	Multiplication factor for Pressure rating
20°C	1.24
25°C	1.12
30°C	1.00
35°C	0.88
40°C	0.76
45°C	0.64
50°C	0.52
55°C	0.40
60°C	0.28
63°C	0.18



a) For other temperatures between each step, interpolation is permitted.

b) For higher temperatures, consult the compound/pipe manufacturer.

Chemical Resistance Chart

GreenAgri PE Pipes have excellent resistance to a wide range of chemical they are ideally suited for conveying highly corrosive fluids and chemical. Generally dilute chemical solution at lower temperatures and stress have very little potential to affect GreenAgri PE pipes. However, at higher temperature with applied stress, the effect of resistance to the chemical will be reduced, Combinations of one or more chemicals also may affect the pipes and under these conditions pre-testing of the pipe for the actual working condition of consulting irrigation system limited directly is recommended.

Medium	23°C	60°C
Acetaldehyde, gaseous	E	G
Acetic acid (10%)	E	E
Acetic acid (100%) (Glacial acetic acid)	E	GC
Acetic anhydride	E	GC
Acetone	E	E
Acetylene tetrabromide	**GtoN	N
Acids, aromatic	E	E
Acrylonitrile	E	E
Adipicacid	E	E
Allyl alcohol	E	E
Aluminum chloride, anhydrous	E	E
Aluminum sulphate	*E	E
Alums	E	E
Ammonia, liquid (100%)	E	E
Ammonium chloride	*E	E
Ammonium flouride, aqueous (up to 20%)	E	E
Ammonium nitrate	*E	E
Ammonium sulphate	*E	E
Ammonium sulfide	*E	E
Amyl acetate	E	E
Aniline, pure	E	E
Anisole	G	E
Antimony trichloride	E	N

GreenAgri POLYPLAST

Chemical Resistance Chart

Medium	23°C	60°C
Aqua regia	N	N
Barium chloride	*E	E
Barium hydroxide	*E	E
Beeswax	*E	**GtoN
Benzene	G	G
Benezenesulphonic acid	E	E
Benzoic acid	*E	E
Benzyl alcohol	E	E to G
Borax, all concentrations	E	E
Boric acid	*E	E
Brine, saturated	E	E
Bromine	N	N
Bromine vapor	N	-
Butanetriol	E	E
Butanol	E	E
Butoxyl	*E	G
Butyl acetate	E	E
Butyl glycol	E	G
Butyric acid	E	G
Calcium chloride	*E	E
Calcium hypochlorite	*E	E
Camphor	E	G
Carbon dioxide	E	E
Carbon disulphide	G	
Carbon tetrachloride	**GtoN	N
Caustic potash	E	E
Caustic soda	E	E
Chlorine, liquid	N	N
Chlorine bleaching solution (12% active chlorine)	G	N
Chlorine gas, dry	G	N
Chlorine gas, moist	G	N
Clorine water (disinfection of mains)	E	
Chloroacetic acid (mono)	E	E
Chlorobenzene	G	N
Chloroethanol	E	EC
Chloroform	**GtoN	N
Chlorosulphonic acid	N	N
Chromic acid (80%)	E	C
Citric acid	E	E
Coconut oil	E	G
Copper salts	*E	E
Com oil	E	G
Creosote	E	E
Creosol	E	EC
Cyclohexane	E	E
Cyclohexanol	E	E
Cyclohexanone	E	E
Decahydronaphthalene	E	G
Desiccator grease	E	G
Detergents, synthetic	E	E
Dextrin, aqueous (18% saturated)	E	E
Dibutyl ether	EtoN	N
Dibutyl phthaiate	E	G
Dichloroacetic acid (100%)	E	GC
Dichloroacetic acid (50%)	E	E
Dicliloroacetic acid methyl ester	E	E
Dichlorbenzene	G	N
Diclolorethane	G	G

Medium	23°C	60°C
Dicioroethyiene	N	N
Diesel oil	E	G
Diethyl ether	EtoG	G
Diisobutyl ketone	E	GtoN
Dimethyl formamide (100%)	E	E to G
Dioxane	E	E
Emulsifiers	E	E
Esters, aliphatic	E	EtoG
Ether	EtoG	G
Ethyl acetate	G	N
Ethyl alcohol	E	E
Ethyl glycol	E	E
Ethyl hexanol	EE	
Ethylene chloride (dichlorothene)	G	G
Ethylene diamine	E	E
Fatty acids (>C6)	E	G
Feric chloride*	E	E
Fluorine	N	N
Fluorocarbons	G	N
Fluorosilic acid, aqueous (up to 32%)	E	E
Formaldehyde (40%)	E	E
Formamide	E	E
Formic acid	E	
Fruit juices	E	E
Fruit pulp	E	E
Furfuryl alcohol	E	EC
Gelatine	E	E
Glucose	*E	E
Glycerol	E	E
Glycerol chlorohydrin	E	E
Glycol (conc.)	E	E
Glycolic acid (50%)	E	E
Glycolic acid (70%)	E	E
Halothane	G	G
Hydrazine hydrate	E	E
Hydrobromic acid (50%)	E	E
Hydrochloric acid (all concentrations)	E	E
Hydrocyanic acid	E	E
Hydrofluoric acid (40%)	E	G
Hydrofluoric acid (70%)	E	G
Hydrogen	E	E
Hydrogen chloride gas, moist and dry	E	E
Hydrogen peroxide (30 %)	E	E
Hydrogen peroxide (100%)	E	
Potassium chloride	*E	E
(100%)		E
Hydrogen sulfide	E	E
Iodine, tincture of, DAB 7	E	GC
(German Pharmacopoeia) Isooctane	E	G
Isopropanol	E	E
Isopropyl ether	EtoG	N
Jam	E	E
Keotones	E	EtoG
Lactic acid	E	E
Lead acetate	*E	E
Linseed oil	E	E
Magnesium chloride	*E	E
Magnesium sulphate	*E	E

Chemical Resistance Chart

Medium	23°C	60°C
Maleic acid	E	E
Malic acid	E	E
Menthol	E	G
Mercuric chloride (sublimate)	E	E
Mercury	E	E
Methanol	E	E
Methyl butanol	E	E
Methyl ethyl ketone	E	GtoN
Methyl glycol	E	E
Methylene chloride	G	G
Mineral oils	E	EtoG
Molasses	E	E
Monochloroacetic acid	E	E
Monochloroacetic ethyl ester	E	E
Monochloroacetic methyl ester	E	E
Morpholine	E	E
Spermaceti		E
Naptha	E	G
Naphthalene	E	G
Nickel salts	*E	E
Nitric acid (25%)	E	E
Nitric acid (50%)	G	N
Nitrobenzene	E	G
o-Nitrotoluene	E	G
Octyl cresol	G	N
Oils, ethereal	G	G
Oils, vegetable & animal	E	EtoG
Oleic acid (conc.)	E	G
Oxalic acid (50%)	E	E
Ozone	G	N
Ozone, aqueous solution (Drinking water purification)	E	
Paraffin oil	E	E
Perchloric acid (20%)	E	E
Perchloric acid (50%)	E	G
Perchloric acid (70%)	E	NC
Petrol	E	EtoG
Petroleum	E	G
Petroleum ether	E	G
Petroleum jelly	**EtoG	G
Phenol	E	EC
Phosphates	*E	E
Phosphoric acid (25%)		E
Phosphoric acid (50%)	E	E
Phosphoric acid (95%)		E
Phosphorus oxychloride	E	GC
Phosphorus pentoxide	E	E
Phosphorus trichloride	E	G
Photographic developers, commecial	E	E
Phthalic acid (50%)	E	E
Polyglycols	E	E
Potassium bichromate (40%)	E	E
Potassium borate, aqueous (1%)	E	E
Potassium bromate, aqueous (up to 10%)	E	E
Potassium bromide	*E	E
Potassium Chloride (100%)	*E	E
Potassium chromate,	E	
aqueous (40%)		
Potassium cyanide	*E	E

Medium	23°C	60°C
Potassium hydroxide	E	E
Potassium nitrate	*E	E
Potassium permanganate	E	EC
Propanol	E	E
Propionic acid (50%)	E	E
Propionic acid (100%)	E	G
Propylene glycol	E	E
Pseudocumene	G	G
Pyridine	E	G
Seawater	E	
Silicic acid	E	E
Silicone oil	E	E
Silver nitrate	E	E
Sodium benzoate	E	E
Sodium bisulphite, weak aqueous solutions	E	E
Sodium carbonate	*E	E
Sodium chloride	*E	E
Sodium chlorite (50%)	E	G
Sodium hydroxide (30% solution)	E	E
Sodium hypochlorite (12%) (active chlorine)	G	N
Sodium nitrate	*E	E
Sodium silicate	*E	E
Sodium sulfide	*E	E
Sodium thiosulphate	E	E
Spermaceti	E	G
Spindle oil	EtoG	G
Starch	E	E
Steric acid	E	G
Succincacid(50%)	E	E
Sugar syrup	E	E
Sulfates	*E	E
Sulfur	E	E
Sulfur dioxide, dry	E	E
Sulfur dioxide, moist	E	E
Sulfur trioxide	N	N
Sulfuric acid (10%)	E	E
Sulfuric acid (50%)	E	E
Sulfuric acid (98%)	G	N
Sulfuric acid, fuming	N	N
Sulfurous acid	E	E
Sulfuryl chloride	N	
Tallow	E	E
Tannicacid (10%)	E	E
Tartaric acid	E	E
Tetrachloroethane	**EtoG	N
Tetrahydrofurane	**EtoG	
Tetetrahydronapthalene	E	G
Thionyl chloride	N	N
Thiophene	G	G
Toluene	G	N
Transformer oil	E	G
Tributyl phosphate	E	E
Trich loroacetic acid (50%)	E	E
Trich loroacetic acid (100%)	E	GtoN
Trich loroethylene	**EtoG	N
Triethanolamine	E	E
Turpentine, oil of Tween 20 and 90	EtoG	G
(Atlas Chemicals)	E	E

Medium	23°C	60°C
Urea	*E	E
Vinegar (commecial conc.)	E	E
Viscose spinning solutions	E	E
Waste gases containing carbon dioxide	E	E
carbon monoxide	E	E
hydrocloric acid (all conc.)		
hydrogen fluoride (traces)	E	E
nitrous vitriol (traces)	E	E
sulfur dioxide (low conc.)	E	E
sulphuric acid, moist (all conc.)	E	E
Water gas	E	E
Xylene, Yeast, aqueous	N	N
Preparations	E	E
Zinc Chloride	*E	E

Key Meaning

E *Resistant (swelling < 3% of weight loss <0.5%; elongation at break not substantially changed)*

G *Limited resistance (swelling 3 - 8% orweight loss 0.5 - 5%; elongation at break reduced by <50%)*

N *Not resistant (swelling > 8% orweight loss > 5%; elongation at break reduced by >50%)*

C *Discoloration*

* *Aqueous solutions in all concentrations*

" *Only under low mechanical stress*

f *Where a key is not printed in the table, data is not available.*

Material Properties of PE

Commonly used Polyethylene materials for pipe manufacturing are graded and abbreviated as given below:

Sr. No.	Abbreviated Name	Expanded name	Density (gms/cm³)
01	HDPE	High Density Poly Ethylene	≥0.940 to <0.965
02	MDPE	Medium Density Poly Ethylene	≥0.930 to <0.940
03	LDPE	Low Density Poly Ethylene	≥0.920 to <0.930
04	LLDPE	Linear Low Density Poly Ethylene	≥0.915 to 0.925

The property characteristics of Polyethylene depend on the arrangement of the molecular chains. The molecular chains are three dimensional and lie in wavy planes. There are side chains of varying lengths, branching from the main chains. The number, size and type of these side chains, in large parts determine the properties of density, stiffness, tensile strength, flexibility, hardness, brittleness, elongation, creep characteristics and melt viscosity that are the results of proper manufacturing efforts which can enhance or deteriorate the service performance of the Poly Ethylene pipe.

World over, the use PE Pipes have been on the increase for the water supply and underground drainage systems for more than 50 years with well documented long term performance of the systems.

Use of HDPE Strong and Durable pipe for Highway Crossing

The HDPE raw material has been undergoing regular developments based on the requirement of the Water supply and Sewerage Infrastructure providers in the last three decade and the pipe raw material has undergone a tremendous improvement in the basic characteristics of the material, making it more suitable for the applications mentioned above.

During 1990s, the grade of raw material has graduated from PE 63 to PE 80 grade and in the late 1990s; it further underwent an improvement to PE 100 grade. The R&D effort in improving the material grade is shown in the tables below for ready reference.

Generation	Material grade	Material	Method of mfr.
First Generation	PE32 & PE40	LDPE	Unimodal
Remarks: Manufacturing method did not change with the field requirement.			
Second Generation	PE 63 & PE 80	HDPE	Unimodal
Second Generation	PE 80	MDPE	Unimodal
Remarks: Method of manufacturing has changed to give better strength to the raw material.			
Third Generation	PE80 & PE100	HDPE	Bimodal
Third Generation	PE80	MDPE	Bimodal

What does the above classification and designation means:

Range of LCL* for 50 years at 20°C in MPa	Minimum Required Strength (MRS) in MPa	Classification Number
10.00 to 11.19	10.0	100
8.00 to 9.99	8.0	80
6.30 to 7.99	6.3	63
5.00 to 6.29	5.0	50
4.00 to 4.99	4.0	40

** LCL = Lower Confidence Limit*

The key success factor of the new generation high grade HDPE raw material was to give safety and reliability to even convey gases underground through them making them environmentally friendly and increasing the lifetime to 100 years for pipes made out of Bimodal readymade PE 100 compounds.

The above grade improvement has increased the pipe performance by increasing the notch resistance as well as Rapid crack propagation and the test properties are given below in the table:

Property	1st generation HDPE	2nd generation HDPE	3rd Generation HDPE
Classification ISO 9080/12162	PE 63	PE80	PE100
Notch Test (SCG) (80°C) ISO 13479	4 MPa ~ 50 hrs.	4 MPa › 165 hrs.	4 MPa › 5000 hrs.
RCP, Pc S4 (0°C) ISO 13477	~ 1 bar.	2 bar	› 10 bar

Property comparison

Property Classification	1st generation	2nd generation		3rd generation
	PE63	PE80	PE80	PE100
Long Term Strength MRS -20°C-50 year	≥6.3 MPa	≥8.0 MPa	≥8.0 MPa	≥10.0 MPa
E- Modulus (MPa)	1200	1000	1100	1200
SCG Pipe Notch Test (80°C)	4.0 MPa › 50 hrs.	4.0 MPa › 165 hrs.	4.0 MPa › 1000 hrs.	4.6 MPa › 1000 hrs.
RCP/S4 Test Pc, 0°C (110mm SDR 11)	1 – 1.5 bar	1.5 – 2 bar	› 10 bar	› 10 bar

The direct advantages due to the above material quality are:

Wall thickness reduction;

- PE63 to PE80 = 20%.
- PE63 to PE100 = 35%.

Weight Reduction;

- PE 63 to PE80 = 18%.
- PE63 to PE100 = 33%

The increase in cross section area of pipe;

- PE63 to PE 80 = 7%.
- PE63 to PE100 = 14%

Material	Wall thickness in mm	Weight in kg/ metre	Cross section area in m²
PE63	45.4	62.253	0.131528
PE80	36.8	50.879	0.142817
PE100	29.7	41.912	0.152488

Note: Diameter of pipe taken for the above table is 500mm OD Pressure class 10 kg/cm² as per ISO 4427.

From the given table it is evident that enormous saving in wall thickness of piping system, increasing the cross sectional area of the pipe of same pressure class, providing a better flow capacity without compromising the functional capabilities of the pipe on a long term basis.

In fact the above tables clearly prove that the functional capabilities of the material are much better in PE100 material grade when compared to PE80/PE63 material grade properties.

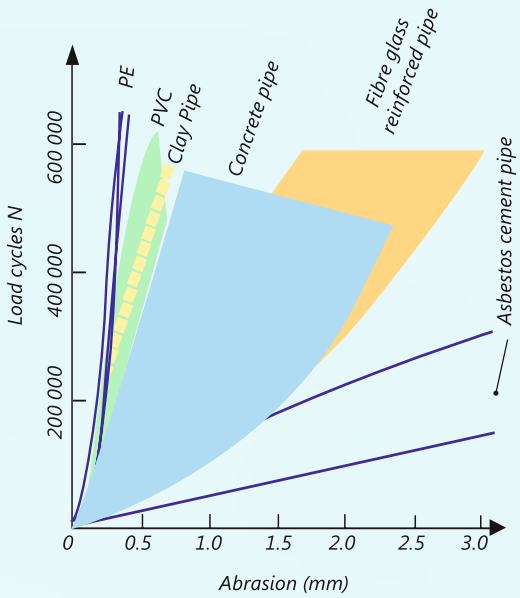
GreenAgri HDPE PIPES are Manufactured in all three grades mentioned. The end user to select the grade of pipe that is required according to the application for which GreenAgri HDPE PIPES are used by him.

24 - 7 X 365 days Technical supports are available worldwide and the users are requests to contact the respective area office of GreenAgri Irrigation System Ltd.

Why to choose polyethylene (PE) pipes?

Polyethylene piping system offers significant advantages over conventional piping systems like Ductile Iron, Mild Steel, Cast Steel and Cement pipe systems. Some of its advantages are as listed below:

1. **Longevity:** PE pipes have the Long track record of excellent performance, approaching 100 years worldwide.
2. **Corrosion resistance:** PE is basically chemically inert. This pipe system does not rust and corrode. This system resists chemical attack from aggressive soils. There is no need for protective layer or finishing process. PE pipe has very good abrasion resistance also.
3. **Leak tight:** Butt fused joints create a homogenous water-tight jointing for the pipe system. Unlike ring type joints or other mechanical jointing systems existing in conventional systems, there is no risk of leakages resulting from joint distortion due to soil settlement or corrosion effect of conveyed water or the soil in which it is buried.
4. **Optimum flow rate:** Smooth inside pipe surface allows for a high Friction Co-efficient "C" factor and it remains constant throughout the lifetime of the PE Piping system due to innate resistance to scaling and biological build-up. Polyethylene is also biologically inert.
5. **Excellent water hammer characteristics to withstand surges:** The inherent properties of polyethylene allow the system to significantly lower the effect of surges due to water hammer when compared with any other Rigid Pipe material of construction..
6. **Flexibility:** Small diameter PE pipes can be coiled and supplied in length up to 2000m. This feature is one of the many contributions to cost & time saving during the installation process.
7. **Resistance to geological conditions:** PE piping systems have inherent resistance to ground temperature fluctuations and earth instability because of high impact and breakage resistance.
8. **Seismic Resistance:** The toughness, ductility and flexibility of PE pipe combined with its other special properties, such as its leak-free fully restrained heat fused joints, make it well suited for installation in dynamic soil environments and in areas prone to earthquakes.



9. **Abrasion Resistance:** PE pipe is a frequent choice for the transport of granular or slurry solutions, such as sand, fly ash and coal. The advantage of polyethylene in these applications is its wear resistance, which for example when conveying fine grain slurries has been shown in laboratory tests to be three to five times greater than for steel pipe. PE pipe has elastic properties that under proper flow conditions allow particles to bounce off its surface. This feature combined with PE's toughness results in a service life that exceeds that of many metal piping materials. There are several factors that affect the wear resistance of a pipeline. The concentration, size and shape of the solid materials, along with the pipe diameter and flow velocity, are the major parameters that will affect the life of the pipeline.
10. High strain-ability under stress virtually eliminates failure due to freezing of conveyed water during extremely cold weather conditions.
11. Reduced installation costs.
12. PE pipe can Achieve Maximum Cold Bending Radius

Pipe SDR	Allowable Cold Bending Radius (R)
≤ 13	R = 20D
> 13 <21	R = 25D
>21	R = 30D

'D' is the pipe diameter

PE Pipe Standard

WALL THICKNESS CHART FOR HDPE PIPE AS PER IS: 4984, YEAR 2016

SDR	SDR 41		SDR 33		SDR 26		SDR 21		SDR 17		SDR 13.6		SDR 11		SDR 9		SDR 7.4		SDR 6	
	Nominal Pressure, PN in bar																			
PE 63	PN 2		PN 2.5		PN 3.2		PN 4		PN 5		PN 6		PN 8		-		-		-	
PE 80	PN 2.5		PN 3.2		PN 4		PN 5		PN 6		PN 8		PN 10		PN 12.5		PN 16		PN 20	
PE 100	PN 3		PN 4		PN 5		PN 6		PN 8		PN 10		PN 12.5		PN 16		PN 20		-	
Nominal Dia (OD)	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.8	2.1	2.2	2.5	2.7	3.1
20	-	-	-	-	-	-	-	-	-	-	-	-	1.9	2.2	2.3	2.6	2.7	3.1	3.4	3.8
25	-	-	-	-	-	-	-	-	-	-	1.9	2.2	2.3	2.6	2.8	3.2	3.4	3.8	4.2	4.7
32	-	-	-	-	-	-	-	-	1.9	2.2	2.4	2.7	2.9	3.3	3.6	4.1	4.4	4.9	5.4	6.0
40	-	-	-	-	-	-	1.9	2.2	2.4	2.7	3.0	3.4	3.7	4.2	4.5	5.1	5.4	6.0	6.7	7.5
50	-	-	-	-	2.0	2.3	2.4	2.7	3.0	3.4	3.7	4.2	4.6	5.2	5.6	6.3	6.8	7.6	8.4	9.3
63	-	-	-	-	2.5	2.9	3.0	3.4	3.7	4.2	4.7	5.3	5.8	6.5	7.0	7.8	8.6	9.6	10.5	11.7
75	1.9	2.2	2.3	2.6	2.9	3.3	3.6	4.1	4.5	5.1	5.6	6.3	6.9	7.7	8.4	9.3	10.2	11.3	12.5	13.9
90	2.2	2.5	2.8	3.2	3.5	4.0	4.3	4.8	5.3	5.9	6.7	7.5	8.2	9.1	10.0	11.1	12.2	13.5	15.0	16.6
110	2.7	3.1	3.4	3.8	4.3	4.8	5.9	6.6	6.5	7.3	8.1	9.0	10.0	11.1	12.3	13.6	14.9	16.5	18.4	20.3
125	3.1	3.5	3.8	4.3	4.8	5.4	6.0	6.7	7.4	8.2	9.2	10.2	11.4	12.7	13.9	15.4	16.9	18.7	20.9	23.1
140	3.5	4.0	4.3	4.8	5.4	6.0	6.7	7.5	8.3	9.2	10.3	11.4	12.8	14.2	15.6	17.3	19.0	21.0	23.4	25.8
160	3.9	4.4	4.9	5.5	6.2	6.9	7.7	8.6	9.5	10.6	11.8	13.1	14.6	16.2	17.8	19.7	21.7	24.0	26.7	29.5
180	4.4	4.9	5.5	6.2	7.0	7.8	8.6	9.6	10.6	11.8	13.3	14.7	16.4	18.1	20.0	22.1	24.4	26.9	30.0	33.1
200	4.9	5.5	6.1	6.8	7.7	8.6	9.6	10.7	11.8	13.1	14.7	16.3	18.2	20.1	22.3	24.6	27.1	29.9	33.4	36.8
225	5.5	6.2	6.9	7.7	8.7	9.7	10.8	12.0	13.3	14.7	16.6	18.4	20.5	22.7	25.0	27.6	30.5	33.7	37.5	41.4
250	6.1	6.8	7.6	8.5	9.7	10.8	12.0	13.3	14.7	16.3	18.4	20.3	22.8	25.2	27.8	30.7	33.8	37.3	41.7	46.0
280	6.9	7.7	8.5	9.5	10.8	12.0	13.4	14.8	16.5	18.3	20.6	22.8	25.5	28.2	31.2	34.4	37.9	41.8	46.7	51.5
315	7.7	8.6	9.6	10.7	12.2	13.5	15.0	16.6	18.6	20.6	23.2	25.6	28.7	31.7	35.0	38.6	42.6	47.0	52.5	57.9
355	8.7	9.7	10.8	12.0	13.7	15.2	16.9	18.7	20.9	23.1	26.1	28.8	32.3	35.6	39.5	43.6	48.0	52.9	59.2	65.2
400	9.8	10.9	12.2	13.5	15.4	17.0	19.1	21.1	23.6	26.1	29.5	32.6	36.4	40.1	44.5	49.1	54.1	59.6	66.7	73.5
450	11.0	12.2	13.7	15.2	17.3	19.1	21.5	23.8	26.5	29.3	33.1	36.5	40.9	45.1	50.0	55.1	60.9	67.1	75.0	82.6
500	12.2	13.5	15.2	16.8	19.3	21.3	23.9	26.4	29.5	32.6	36.8	40.6	45.5	50.2	55.6	61.3	67.6	74.5	83.4	91.8
560	13.7	15.2	17.0	18.8	21.6	23.9	26.7	29.5	33.0	36.4	41.2	45.4	50.9	56.1	62.3	68.6	75.7	83.4	93.4	102.8
630	15.4	17.0	19.1	21.1	24.3	26.8	30.0	33.1	37.1	40.9	46.4	51.1	57.3	63.1	70.0	77.1	85.2	93.8	105.0	115.6
710	17.3	19.1	21.6	23.9	27.3	30.1	33.9	37.4	41.8	46.1	52.2	57.5	64.6	71.2	78.9	86.9	96.0	105.7	118.4	130.3
800	19.5	21.6	24.3	26.8	30.8	34.0	38.1	42.0	47.1	51.9	58.9	64.9	72.8	80.2	88.9	97.9	108.2	119.1	-	-
900	22.0	24.3	27.3	30.1	34.7	38.3	42.9	47.3	53.0	58.4	66.2	72.9	81.9	90.2	100.0	110.1	121.7	134.0	-	-
1000	24.4	26.9	30.3	33.4	38.5	42.5	47.7	52.6	58.9	64.9	73.6	81.1	90.9	100.1	111.2	122.4	-	-	-	-
1200	29.3	32.3	36.4	40.1	46.2	50.9	57.2	63.0	70.6	77.8	88.3	97.2	109.1	120.1	-	-	-	-	-	-
1400	34.1	37.6	42.5	46.9	53.9	59.4	66.7	73.5	82.4	90.7	103.0	113.4	-	-	-	-	-	-	-	-
1600	39.0	43.0	48.5	53.5	61.6	67.9	76.2	83.9	94.2	103.7	117.7	129.6	-	-	-	-	-	-	-	-
1800	43.9	48.4	54.6	60.2	69.3	76.3	85.8	94.5	105.9	116.6	-	-	-	-	-	-	-	-	-	-
2000	48.8	53.8	60.6	66.8	77.0	84.8	95.3	104.9	117.7	129.6	-	-	-	-	-	-	-	-	-	-

NOTE :

- Pipes conforming to ✤ ISO-4427 ✤ DIN-8074 ✤ IS-4984 ✤ IS-14151 ✤ IS-14333 all with latest amendments
- Custom made pipe and fittings are also available on demand.
- Coiled Pipes also available based on diameter

(All Dimensions are in mm)