

## Comparison between H&T Steel Mesh Reinforced HDPE Pipe and ISO4427 PE100 Pipe

### ONE: Performance Comparison

#### 1. Wall Thickness/SDR

HTIDC Steel Mesh Reinforced PE pipe			Any PN	ISO4427 PE100		PN20		PN16		PN10	
Specification (mm)	Inner Dia.(mm)	Outside Dia.(mm)	Wall Thickness	Specification (mm)	Outside Dia.(mm)	Wall Thickness	Inner Dia.(mm)	Wall Thickness	Inner Dia.(mm)	Wall Thickness	Inner Dia.(mm)
80	80	104	12	110	110	13.7	82.6	11.1	87.8	7.4	95.2
100	100	124	12	125	125	15.6	93.8	12.7	99.6	8.3	108.4
125	125	149	12	160	160	19.8	120.4	16.2	127.6	10.6	138.8
150	150	174	12	200	200	24.8	150.4	20.2	159.6	13.2	173.6
200	200	225	12.5	225	225	27.9	169.2	22.7	179.6	14.9	195.2
250	250	275	12.5	250	250	30.8	188.4	25.1	199.8	16.4	217.2
300	300	325	12.5	315	315	38.9	237.2	31.6	251.8	20.7	273.6
350	350	380	15	355	355	43.8	267.4	35.6	283.8	23.4	308.2
400	400	430	15	400	400	49.3	301.4	40.1	319.8	26.2	347.6
450	450	482	16	450	450	55.5	339	45.1	359.8	29.5	391
500	500	532	16	500	500	61.5	377	50.1	399.8	32.8	434.4
600	600	640	20	630	630	77.5	475	63.1	503.8	41.3	547.4

#### 2. Weight

H&T Steel Reinforced PE Pipe PIPE			ISO4427 PE100 (PN20/SDR9)		Comparison Result
Inside Diameter	Outside Diameter	Kg/m	Outside Diameter	Kg/m	
DN100	DN124	8	125	4.9	+63%
DN125	DN149	10	140	6.2	+61%
DN150	DN174	11	160	8.0	+38%
DN200	DN225	15	225	15.8	-5%
DN250	DN275	18	250	19.5	-8%
DN300	DN325	22	315	31.0	-29%
DN350	DN380	28	355	39.3	-29%
DN400	DN430	32	400	49.9	-36%
DN450	DN482	43	450	63.2	-32%
DN500	DN532	50	500	77.9	-36%
DN600	DN640		630		

### 3. Sectional area

For a certain outside diameter, thinner wall leaves larger inside area of section. The following two PN20 pipe examples show how much area of section is increased.

	PN20 Pipe Example 1 (mm)				PN20 Pipe Example 2 (mm)			
	Outside Diameter	Wall	Inside Diameter	Sectional Area	Outside Diameter	Wall	Inside Diameter	Sectional Area
ISO4427 PE100	280	31.3	217.4	37,101mm <sup>2</sup>	500	61.6	377	0.085m <sup>2</sup>
H&T Steel Reinforced PE Pipe	275	12.5	250.0	49,062 mm <sup>2</sup>	482	16.0	450.0	0.159m <sup>2</sup>
Compare	-5	-18.8 (60%)	+32.6 (115%)	11,961mm <sup>2</sup> <b>(132%)</b>	-18	-45.6 (26%)	+73 (119%)	0.074m <sup>2</sup> <b>(187%)</b>

H&T Steel Reinforced PE pipes can increase area of section by 1/3 with the same or slightly thinner pipe. This represents significant increase of flowing capacity.

Example 1: ISO4427 PE100 (Outside D= 280)

H&T Steel Reinforced PE Pipe (Outside D= 275)



### 4. High Pressure

The highest pressure in ISO4427 is PN25, but H&T Steel Reinforced PE Pipe can achieve PN40. Nominal pressures for different sizes are shown in the table.

	DN50	DN65	DN80	DN100	DN125	DN150	DN200	DN250	DN300	DN350	DN400	DN450	DN500	DN600
PN15	X	X	X	X	X	X	X	X	X	X	X	X	X	X
PN12.5	X	X	X	X	X	X	X	X	X	X	X	X	X	X
PN16	X	X	X	X	X	X	X	X	X	X	X	X	X	X
PN20	X	X	X	X	X	X	X	X	X	X	X	X	X	
PN25	X	X	X	X	X	X	X							
PN30	X	X	X	X	X									
PN35	X	X	X											
PN40	X	X				X								

**5.Long-term hydrostatic strength**

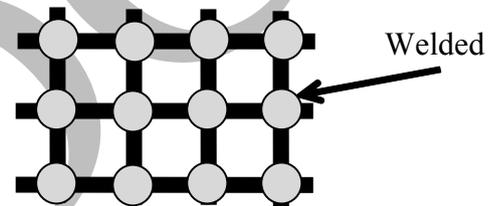
Most internal stress, mainly coming from pressure, is borne by steel mesh for H&T Steel Reinforced PE Pipe so the PE itself is largely relieved from stress. So H&T Steel Reinforced PE Pipe has much better creep resistance to avoid long term damage. The following table shows test results by *Tested by Broutman Laboratory, Chicago.*

	Loop Stress	Time
PE100	11.4 MPa	15041 Hour
SCHDPE	31.0 MPa	22752 Hour

The pipe lifetime is mainly decided by three factors – stress, temperature and media. For a certain media and temperature, a higher long-term hydrolic strength means longer lifetime or higher pressure to withstand.

**6.Rapid Crack Propagation Resistant and Environment Stress Crack Resistant Comparison**

Every cross over of the steel mesh is welded. When such welded mesh is embedded in the PE, it will strongly hold the PE together. The following table shows the test result by *Belgian Research Centre for Pipes and Fittings*



	Inner Pressure	Crack Length	Outside Diameter
SCHDPE	1	No crack	174 mm
PE100	0.89	95 mm	110 mm

Such superior performance of resistance to cracks, the possibility for cracks to happen is low; and if a crack happens, the steel core will significantly reduce the crack propagation whatever the crack direction is.

**7.Impact resistance and dimension stability**

The elasticity modulus of steel is about 200 higher than that of the HDPE. Such a steel cored structure makes H&T Steel Reinforced PE Pipe impact resistance and dimension stability far beyond than any types of plastic pipes including HDPE. The mesh steel core configuration also preserves flexibility in the axis direction. The superior performance in both rigidity and flexibility provides a strong resistance to vertical load created by earth movement or vibration from traffic. This feature also makes it suitable for situations where a pipeline in slow curve is required. It also makes it easy for transportation and installation.

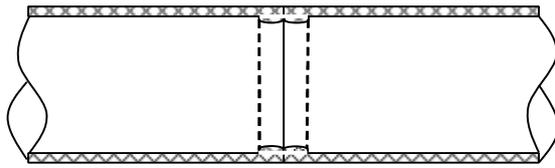
**8.Temperature**

When temperature rises, PE strength is reduced quickly, but steel only changes very slightly in the range of 0-100°C. So the ability for H&T Steel Reinforced PE Pipe pipe to withstand pressure reduces slowly with temperature rises. The “Pressure Reduction Coefficient” for PE pipes is specified in 40°C as 0.73 in ISO4427-1. H&T Steel Reinforced PE Pipe pipe can achieve 0.9. PE pipes will be distorted in extreme environmental condition, such as high temperature. H&T Steel Reinforced PE Pipe pipe will be much less distorted in such a condition and will keep the pipeline straight. Therefore, H&T Steel Reinforced PE Pipe

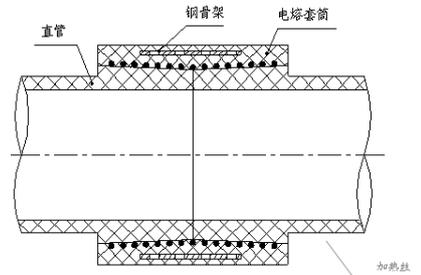
pipe is suitable for high temperature and even can be used in high temperature where ISO4427 PE pipe cannot be used.

## 9. Smooth inner wall in low resistance

The hot plate welding of ISO4427 PE pipe will inevitably form a bead on the inner wall. So many beads along the pipeline generate a significant reduce the inner diameter resistance to the media transportation. H&T Steel Reinforced PE Pipe electrofusion technology welds an electrofusion coupler outside the pipe, so inner wall beads will not be generated.



Normal PE Pipe connection  
Pipe Pipe connection



H&T Steel Reinforced PE

## 10. Strong electrofusion connection

- Large welding area

H&T Steel Reinforced PE Pipe Electrofusion Coupling method provide a very large welding area, which is  $\pi DL$ . D is outside diameter and L is width of the Electrofusion Coupler. Take DN400 for example, the welding area is

$$3.14 \times 0.4\text{m} \times 0.3\text{m} = 0.38\text{m}^2.$$

A normal PE pipe only welds wall section area, which is  $\pi DW$ . W is wall thickness. For a DN400, we have

$$3.14 \times 0.4\text{m} \times 0.025\text{m} = 0.03 \text{ m}^2 \text{ for SDR 17}$$

$$3.14 \times 0.4\text{m} \times 0.037\text{m} = 0.05 \text{ m}^2 \text{ for SDR 11}$$

$$3.14 \times 0.4\text{m} \times 0.047\text{m} = 0.06 \text{ m}^2 \text{ for SDR 9}$$

- Steel skeleton fittings

The steel structure of fittings are solid steel skeleton, rather than steel mesh. This skeleton is much stronger than mesh, but it is not flexible.



- Double layer effect

The Electrofusion Coupler and the pipe form a double wall at the connection point.

Generally speaking, the connection point for a normal PE pipe will be 20% weaker than pipe body. However, for H&T Steel Reinforced PE Pipe pipes, the connection point is stronger than pipe body. During our extensive pressure tests, pipe always breaks in pipe body, rather than in connection point. This feature significantly reduces the possibility of leakage and damage to the environment.

## TWO: Installation Comparison

### 1. Weight of welding machine

A normal PE pipe welding machine is about 150kg. Our electrofusion welding machine only weighs 20kg. It can be carried by one man, so it is much more convenient.

### 2. High rising installation

For normal PE pipes, the welding machine needs to be lifted up so installation is difficult. But for H&T Steel Reinforced PE Pipe pipe, the welding machine stays on the ground and you only need to connect electrical wires. This is important for chemical plant pipe or mining pipes.

### 3. Welding time

The welding time is 10-20 minutes for DN250. Total connecting time is about 30 minutes, generally less than half required for an ISO4427 PE pipe.

### 4. Multi-joint operation

For ISO4427 pipes, you can only connect pipes at one point, or maybe two sometimes. You have to wait for complete cooling of the welded joint before moving to the next point. With H&T Steel Reinforced PE Pipe, you only need to hold the welded connection using a simple holding bracket, because the coupler holds the two jointed pipes together. So once the joint is welded, you can immediately move to the next joint.

### 5. Pipe weight

The weight is much less than ISO4427 PE pipes. Most pipes can be moved by hand.

### 6. Welding machine operation

Our welding machine is an intelligent machine. It automatically detects the pipe model and will configure to the best parameters. The machine does not have any contact with pipes. You only connect wires to pipe. It is also easy to monitor the welding progress. The whole welding process is easy to operate and avoids human interference very much.

### 7. Man power

Because of the above features, significant man power is saved and quick installation can be achieved comparing ISO4427 pipes.

## 8. Fuel consumption

H&T Steel Reinforced PE Pipe pipe installation consumes less power in welding. It even save fuel consumption for generator and crane because there are no heavy jigs to move between butt welds.

## THREE: Cost Comparison

Costs can be saved in almost all respects.

### 1. Pipe cost

For a project, the basic requirement is media transportation rate.

- You can use a smaller pipe with higher pressure to achieve the specified transportation.
- Even using the same pressure, you can also use a smaller pipe because inside diameter is large and section area is even larger.

### 2. Installation cost

Installation cost is much lower than normal pipes because of less man power, shorter time, easier transportation because of less weight, and less fuel consumption.

### 3. Maintenance cost

- Features described in Section One makes H&T Steel Reinforced PE Pipe pipes much more reliable, robust and longer lifetime.
- Steel core provide a good traceability. The pipe can be detected using a metal detector.
- The electrofusion welding is much easier than ISO4427 pipe. This makes repairing a simple process.

Cost saving rate is different from project to project. However, savings are possible. Normally, the bigger diameter of the pipe, the more savings. H&T Steel Reinforced PE Pipe pipes are especially suitable for large pipes.