Technology Development
& Equipment Supply Ltd
First Floor, 5 Ossian St, P.O. Box 12099
Ahuriri, Napier 4044, New Zealand
Tel: +64 6 835 1401 Fax: +64 6 835 0108
www.tdes.co.nz

GFT-RTP EXPERIENCE & ISSUES

GFT-RTP has been produced and successfully sold for 6 years in China. Sizes include:

- GFT-RTP160 (spoolable) series (mm): 50,63,75,90,110,160
- GFT-RTP 250 series(mm): 90,110,160,200,250
- GFT-RTP1000 series(mm): 630,710,800,900,1000

The annual turnover is approximately 500 million RMB. These pipes are mainly used for the transportation of natural gas, crude oil, solid-liquid mixtures such as tailings, mud, etc. and also for fresh water and sea water.

Because this kind of composite pipe has the pressure bearing capacity equivalent to steel pipes' and has the advantages of plastic pipes, such as better corrosion resistance and lighter in weight, it is highly rated and valued by end users. Many Engineering Institutes and end users say this is the kind of pipe they have always wished for.

During the GFT-RTP practical applications, some problems have been experienced. After working with industry experts, Engineering Institutes and construction parties, these problems were solved one by one. The two prominent problems are explained in detail as below.

A: Low ring stiffness:

The ring stiffness of the pipe is closely related to the circumferential deformation of the pipe. The higher the ring stiffness, the smaller the pipe's circumferential deformation. The ring stiffness of the pipe is linearly related to the elastic modulus of the pipe material, and to the third power of the pipe wall thickness. Taking GFT-RTP with nominal pressure of 1.0MPa and outer diameter of 800mm as an example, its wall thickness is 24.5 and the ring stiffness is about 4KN /m2, while HDPE pipes of the same pressure level have a wall thickness of 47.4 and a ring stiffness of about 22KN / m2. The test shows that when GFT-RTP is buried at a depth of 2 meters, the vertical deformation of the vertex reaches 10%, which greatly exceeds 5% of the requirements of the construction regulations. Does it mean that GFT-RTP does not meet the requirements for application? Annular deformation of buried pipelines is a complex problem, mainly due to the interaction of backfill soil and the pipe body. The solution we adopted is to put the connected pipe in the trench, fill the pipe with water and maintain 1.2 times the nominal pressure, and then backfill. After the backfill soil settles down (about a few days), empty the water and check the vertex and the vertical deformation is only 1%, which meets the requirements of construction technical regulations.

B: Connection:

The connection between pipes, the connection between pipes and other equipment is an important part of the pipeline system. The reliability, convenience and economy of the connections are three important indicators to measure the connection technology. At present, the connection method of RTP is mainly to use metal connectors to connect, as shown in Figure 1 and Figure 2. The metal connector is composed of two parts: plug and sleeve; plug is inserted into the RTP, the sleeve clamps the RTP and the plug, and the flange on the plug is connected to another flange. Figure 1 is for underwater RTP connections while Figure 2 is for land RTP connections.

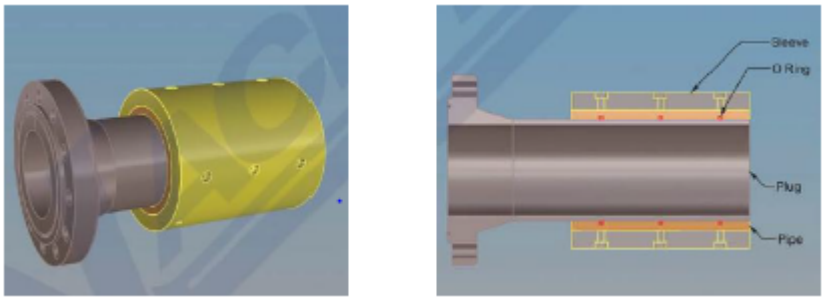

Figure 1: Underwater RTP connection structure diagram

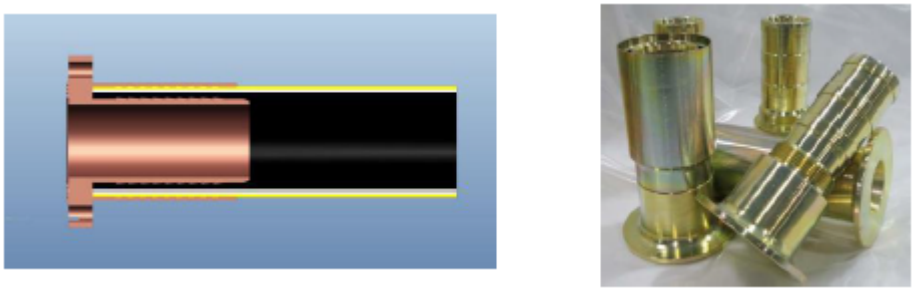

Figure 2: Land RTP connection structure diagram Steel connector

Three RTP connection methods:

1. The inner diameter of the inner tube is smaller than the inner diameter of the RTP, which will cause to an increase in the transmission resistance, and many users require that the inner diameter of the connection must be the same as the RTP inner diameter.
2. On the inner and outer layers of plastic, the axial tensile force can only be resisted by the plastic, and the high-strength reinforcement layer does not play a role. The greater the axial tensile force, the longer the connector.
3. The third is that the medium is in direct contact with the metal. Anti-corrosion treatment is difficult to meet the requirements in some occasions.

The solutions that have been proved to be effective in practical applications are put forward to resolve the existing problems of current RTP connection and to meet the requirements raised by customers.

For the first and second problem, the solution is shown in Figure 3. Expand the GFT-RTP to the appropriate size, and then insert the metal inner tube with the same inner diameter as RTP's into the RTP. The metal inner tube has a deep circumferential groove. When the outer sleeve is clamped, not only the inner and outer plastics are deformed, but also the strengthen layer are bigger deformed as well. The axial force of the RTP is mainly borne by the reinforcement layer.

Figure 3: Equal diameter connection diagram *Actual part*

For the third problem, the solution is shown in Figure 4. Melt a part of the plastic on the GFT-RTP tube end to form a large end (PIPE END), and then lock the two ends with a jacket (armour), so that the medium only contacts the plastic, and the metal jacket only needs to be normal anti-corrosion treated. It is a reliable and economical connection method.

Figure 4: *Armoured connection structure diagram (top graphic)*
Actual part (lower photo)