Jabitherm Rohrsysteme AG
Brügger Str. 6
53842 Troisdorf
Telefon : 0 22 41 / 95 35 –0
Telefax : 0 22 41 / 4 78 71 www.jabitherm.com

Changing times for pipe insulation

Innovations are not only possible in the „high tec“ area

Since several centuries regardless of the insulation purpose the same techniques have been used for cold or hot temperature insulation or for simple contact safety only. The medium pipe will be installed on site and then the insulator will do the required insulation. For long distance runs of insulated pipes this technique has meanwhile become questionable.

In companies which have to install long distance piping such as the chemical and petrochemical industry a more modern technique is increasingly gaining acceptance. The composit pipe systems which have been successfully introduced in the years 1970 to 1980 for underground installations had model character for this new technology.

The principle is as simple as it is convincing. A carrier pipe irrespective of its material is lined with polyurethane foam in the factory. The outer protective jacket consists of a spirally wound pipe as normally used in the field of air-conditioning installations. This jacketing connects very well to the carrier pipe due to the high bonding strength of the PU foam.
The use of metal sheeting for the outer casing has the advantage that such material is known to the insulator on site and in addition can be well combined with the conventional insulating technology.

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The HDPE jacketing as mostly used for the underground pipe technology did not gain acceptance for the open air installations due to its UV instability.

For the open air installations following outer casing alloys are in use:

Seawater resistant Aluminium	mostly AlMg3
Aluminium-Zinc	
Stainless Steel	mostly 316
Galvanised sheeting's	

Contrary to the use in the air venting industry it needs to be mentioned that the spiral piping for the outer jacketing is manufactured in such way that the lock runs on the inside of the piping in order to avoid raptures of the same during installation work. This way the pipe surface is rather smooth and can be well connected with insulation-work necessary to be done on site.

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Thus the following advantages can be achieved:

- Less scaffolding and less time because of the combined installation of piping and insulation.
- Long lasting and step resistant insulation.
- Mounting and supporting clamps are attached to the outer casing which means no moisture intrusion i.e. no corrosion danger and no temperature bridges.
- Less insulation diameter for equal insulation values.
- Possibility to combine this new technology with the conventional insulation technique.

What is the expansion and deflexion behaviour of these pipes?

1. Expansion

With the exception of isolated cases at which the carrier pipe has a very low elasticity module as f. i. HDPE piping it can be said that the expansion behaviour of preinsulated pipes is equal to the one of the uninsulated carrier pipes. Normally the carrier pipe is the main factor for the elongation. The movements of the carrier pipe are forced on the other two components i.e. the PU foam and the jacketing. This has the advantage that all movements of the carrier pipe are directly transferred to the supporting clamps. The stability of the outer spiral piping and the compression strength of the PU foam are high enough to install the supporting clamps directly around the outer casing of the pipe. The subject of fixpoints needs separate considerations.

2. Deflexion

The composit piping leads to a reinforced system. As already mentioned earlier it is the behaviour of the carrier pipe that is most influential. In regard to the deflexion behaviour of the system the three components form one unit. The deflexion behaviour of a given system can be calculated by the system manufacturer. In approximation it can be said that the weight of the insulation is compensated by its strong bonding to the pipes. Therefore the normal calculating rules for determining the fixpoint outlay can be applied.

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What corrosion properties can be expected?

These pipe systems are in use since about 15 years. Compared to conventionally insulated pipes it has been shown that the preinsulated pipe system shows obvious advantages in its long term behaviour. Corrosion bridges at the mounting and supporting clamps are avoided.

Thus the advantages of the insulating technique become especially visible after a few years of line operation. Over time it can often be observed that the conventional insulation is damaged or partly dismantled due to deflexions of the carrier pipe or the mistreatment of the outer casing and the insulation. In such cases moisture can penetrate into the insulation which leads to corrosion at the carrier piping and to reduced insulation values. Long-term analysis has shown that such damages can lead to up to 30% loss in insulation efficiency. Those negative influences cannot be observed on preinsulated piping systems. Neither can any deflexion of the piping lead to dislocations for the insulation nor can the outer jacketing be damaged by stepping on it. Unfortunately the longevity of a product does not find respective attention at the time of purchase,

Since quite a number of years the PUR foam in use is free of CFC's; therefore the former suspicions that chlorides out of the foam could favour stress cracks at stainless steel are no longer valid.

How is the system combined with conventional pipe insulation's?

Composite piping systems offer advantages especially for straight runs of pipes. Therefore they are presently mostly used at installations of longer distance piping. Normally preinsulated pipes of 6 or 12 m. lengths are supplied by the manufacturer. Bends, valves and other structural parts are integrated with the piping on site. The loops are put together out of bends and pipes according to specific requirements. These not insulated parts consisting of bends and joints account for about 5 to 10% of the total insulation. The insulation of these parts will be done on site either with 2 component PUR foam or mineral wool in the conventional manner.

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The requirements on the material for the outer jacketing and the build up of the insulation differ strongly and are depending on the technical specifications of the customer.

What installation costs are adherent to the composite pipe system?

Users that are unfamiliar with the system normally are reacting very reluctantly because they are expecting difficulties at the installation and higher costs. In practice it has been shown, however, that the installation of the system into the pipe bridge requires only minor or no additional charges. Somewhat higher costs can be expected for the mounting clamps since their diameter has to be designed to fit the outer casing and not the carrier pipe. .This minor disadvantage is more than compensated by savings for less scaffolding. Installators that are familiar with the system are often using interval scaffolding only. Pipe runs of up to 36 m are welded together, completely insulated and then lifted in one piece onto the pipe bridge. There is no need for scaffolding of great parts of the pipe rack

What are the maintenance costs?

If the right material composition for the outer jacketing has been selected there is no need for later painting or sandblast expenses. Another advantage is the fact that the pipes can be stepped on without harm which is due to the very compact insulation of the pipes.

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Heat tracing possible?

What is to be done if an accompanying heating is necessary? For these cases cost efficient solutions have been developed that allow electrical, water or steam tracing. Especially for the electrical tracer cable it has become common to integrate small tubes into the insulating foam.
In order to install electrical heating Teflon coated tracer cables are inserted into the prepared tubes. Due to it´s very smooth surface these cables can be easily inserted without any joints. Also selflimiting electrical cables can be used.

Water and / or steam heatings have also been manufactured in a similar way.

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How do costs for this system compare with those of conventionally insulated pipes?

A question for which no uniform answer is possible Prices for preinsulated pipes vary depending on the amount of pipes per order, the kind of insulation and whether heat tracing is required. Generally it can be said that the preinsulated pipe system shows i greatest merit at long straight runs of piping. In these cases the continuous production is advantageous compared to the conventional insulation on site. On the other hand the system is not recommended for complicated piping as for instance inside the reaction area.

Installation firms who are experienced with the system are using scaffolding points only and this way can reduce installation costs considerably

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Which materials can be supplied?

Basically all types of piping that are nowadays used in the field of pipe construction. The type and material of the carrier pipe will be defined by the customer and supplied according to his technical specification. Also the jacketing piping will be manufactured according to demand. The insulation thickness may vary from 15 mm to 150 mm with limitations for extreme wide diameter pipes (< NW800) and for very thin walled piping as f.i. drainage pipes.

Where is the system already in use?

Predominantly in the chemical industry. This industry operates long runs of piping where the advantage of the system becomes very visible. Apart from the chemical industry the system finds application in various mayor construction works of other industries.

The example of this system proves that development innovations are possible even in fields that seem to be absolutely mature. It also shows, however, that not every improvement is already accepted.

Past has shown, however, that in the long run the better solution will finally overcome even a well established conventional technology.

Wilfried Hoppe

Jabitherm Rohrsysteme AG

Troisdorf Germany

+49 2241 95350

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