

### 3 Planning criteria

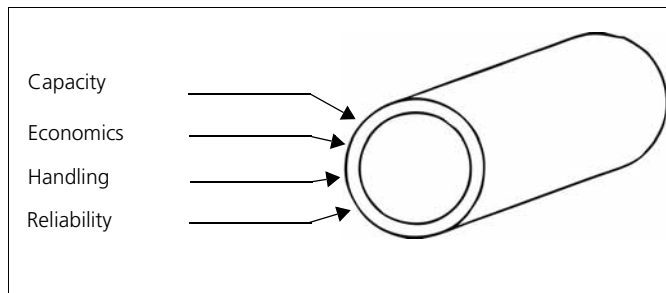


Figure 3.1

#### 3.1 Selection criteria for PE pipe systems

For a professional and economic construction of plastic pipe systems a series of parameters and criteria have to be considered in planning. To employ plastic pipe systems made of PE the following has therefore to be included in the general considerations.

##### Economics

Economics is one of the most important factors that tip the balance concerning the use of materials in planned applications. The question of price is not the only crucial factor included under the term "economics", but equally decisive in assessing economic considerations are life-span, flexibility, ease of installation, handling and increasingly stronger concerns about environmental impact as well. A cost comparison of pipe installations usually involves facilities made from plastic with those made from other materials such as metal, concrete or clay. Due to shortened installation times and ease of handling, plastic pipe systems enable important cost savings.

A further factor involving economic considerations of using PE plastic pipe systems is the reduced maintenance with respect to corrosion protection. The costs of preserving and maintaining an installation are regarded as a cost-intensive part of an overall project and therefore affect the investment decision after the fact.

The advantages and disadvantages of PE in pipe and equipment construction will be discussed on the basis of some practical applications. The potential of PE as a problem solutions will be indicated in subsequent parts of this Specification Manual. Based on more than 40 years of experience with PE, Akatherm BV possesses fundamental knowledge about installation techniques and solutions to the problems that arise in plastic pipe construction.

We are pleased to share this expertise with our customers. Akatherm will, however, restrict itself in this Specification Manual to application techniques and resulting problem solutions involving the use of PE in plastic pipe systems.

##### Capacity

There are many requirements in industrial pipe construction, and process-related details frequently necessitate the manufacture of components of various geometries and configurations.

Akatherm places a great deal of value on the continuous contact with its customers in order to maintain regular exchanges of information. Years of experience with our products as well as their continuous adaptation to the needs of our customers has led to steady development and expansion of our product range. We have a large range of injection moulding components from our own production facility at disposal. The product range PE100 spigot fittings consists of:

- Short spigot fittings for butt-weld
- Elongated fittings for butt-weld and electrofusion
- Fittings made from pipe
- Flanges and gaskets

On account of these components, Akatherm is capable of offering a solution for every connection of PE pressure pipes.

##### Reliability

Every malfunction, if only of short duration, incurs costs and reduces confidence in the reliability of facilities. Users should therefore make sure ahead of time that their decisions in choosing the right materials involve sufficient attention to quality assurance. The demands of operational reliability begin in the earliest project stage and must be comprehensively realised in compliance with rules and regulations as well as the available testing methods. Incisive knowledge, professional advice and optimal processing are important pre-requisites for reliable and proper-functioning plastic pipe systems.

##### Handling

In employing PE materials, attention must always be paid to the fact that, beside all the advantages over conventional materials, there are also some disadvantages and therefore certain rules have to be followed. Just as in processes involving other materials, the use of plastic in pipe systems requires appropriate expertise and care. In contrast with conventional materials, the mechanical factors of PE are significantly affected by internal and external influences (e.g. medium and environmental temperatures). In contrast to concrete or other materials employed in pipe construction, PE pipe systems possess a comparably small surface hardness, which is compensated by high flexibility and long life-span. A positive property worth mentioning is the good chemical resistance of PE against many aggressive media. Conventional pipe materials such as concrete are unsuitable. Unlike conventionally employed materials, appropriate exploitation of the offered advantages yields more technical possibilities for solving numerous problems during installation. In most cases resolved in an uncomplicated manner. The handling of plastic materials is relatively easy to learn, but basic manual training is nevertheless beneficial.

The following rules are to be observed when working with PE pipes:

- Pipes are to be transported in appropriate vehicles and carefully loaded and unloaded.
- During transport, they should not be exposed to impact loads.
- Surfaces are to be protected against mechanical influences and their effects (such as grooves, scratches, notches and the like).
- Storage should occur in such a manner that the products are not exposed to the effects of heat, solar radiation, UV radiation or other adverse atmospheric and/or environmental influences for any length of time.
- The products should not be soiled any more than is necessary. The supporting surfaces for the pipes and fittings must remain free of stones and level under all conditions.
- Deformations of the pipes can be prevented by restricting stacking heights. As a rule, do not stack PE pipes higher than 1 metre.

#### 3.2 User instructions

Loads to which pipe systems are exposed during installation or operations are indispensable variables for the engineer. The reasons for this information need involve the behaviour of plastic, which is directly affected by external and internal parameters such as internal pressures as well as temperature fluctuations of the environmental and the flow medium. These influences have a great deal of significance for the life expectancy of a plastic pipe system. The necessary information about the expected loads that could affect the pipe system have therefore to be considered even in the planning phase.

For this purpose a selection of recurring considerations regarding material application and processing is gathered into the form of a checklist.

## Planning criteria

### 3.3 Checklist for pipe and equipment contractors

What is to be considered?	Pipework	Equipment
Are the dimensions of the pipes and fittings (connecting dimensions) as well as the material data clear and complete?	x	x
Are the requirements of the fittings appropriately indicated (dimensions, load, chemical resistance)?	x	x
Is the standard length of pipe sufficient or are custom lengths possibly more economical?	x	
Given the component dimensions based on the indicated catalogue sizes, is a prefabricated part more appropriate?	x	
Does the external and internal pipe diameter conform to the chosen nominal size?	x	x
Is statistic evidence to be provided? Should or must an engineer be brought in?	x	x
Do the flanged connecting dimensions indicated in DIN 2501 or ASTM correspond to the pressure ratings for armatures and components?	x	
Are special product requirements demanded by the operator, agency or authorities?	x	x
Are acceptance tests required or must test reports be issued in accordance with EN 10204?	x	x
When are the delivered fittings required on the construction site? Are there adequate storage facilities or are on-demand deliveries to be agreed?	x	x
What are the possibilities for transport to the construction site? Is packaging of products required or possible?	x	
During installation work, is there surveillance by a neutral agency?	x	x
Are there certified welders for the welding work and are they available?	x	x
Does the welding and auxiliary equipment meet the requirements of current standards?	x	x
What are the local conditions?		x
If applicable, do the components have to be manufactured on site?	x	x
Are facilities available for a final pressure or leakage test?	x	x
Must these be documented?	x	x
Are suppliers and/or manufacturers aware of the operating conditions?	x	x
Important information includes:		
- the medium or nature of the flow substance in order to determine the chemical resistance (if applicable, additional information must be obtained from the pipe manufacturer!)	x	x
- the temperature limits ( $T_{i \min}$ ) and ( $T_{i \max}$ ), the load duration, and the medium that loads the pipe or fitting	x	x
- the environmental temperature ( $T_{i \min}$ ) and ( $T_{i \max}$ )	x	x
- the internal pressure ( $p_{i \min}$ ) and ( $p_{i \max}$ )	x	x
- the negative pressure ( $p_u$ )	x	x
- the external pressure ( $p_a$ ) (e.g. soil loads, etc.)	x	x
- does the data involve conditions of continuous load or intermittent operation?	x	x
- does the system to be installed involve an aboveground or an underground system?	x	x
- could there be long periods of disuse with unfilled pipes?	x	
- are pressure surges resulting from pump operation to be expected? Size?	x	x
- are the respective weld parameters known?	x	x
- must special manufacturing guidelines or instructions be followed as well?	x	x

Table 3.1