What should be taken under consideration while choosing a valve?

While selecting a solenoid valve that is the most suitable for a particular installation, it is essential to define all important valve operating conditions and take into consideration the following guidelines:

1) **rodzaj medium** - gas, water, oil (its density, temperature and viscosity)

In case the valve is to operate with non-typical medium, which is not specified in the catalogue data, it is essential to verify:

- if the medium is not too dense (in most cases density should not exceed 21 cSt)
- if it is not aggressive to valve construction materials and seals used or contact Technical Department of the manufacturer send an email

2) Nominal valve diameter / Pipe size - it is nominal diameter DN of pipe termination (internal diameter of pipeline). It should be equal to valve orifice diameter. In many cases industrial pipelines are over-dimensioned, which means that the size of pipes are bigger than actually needed (from calculations based on linear and local resistances). Therefore constriction in the place of valve installation is acceptable (if calculations will allow)

3) Pressure difference ΔP the valve will operate at - dictates the choice between sort and type of the valve. Maintaining pressure drop across the valve on minimal level is desirable for developed or complicated systems. However it is also necessary to note that some valves (i.e. servo operated and assisted lift valves) operate due to this pressure difference. If pressure differential across the valve, being a result of flow conditions (see point 4), is lower than specified for particular valve minimal pressure differential ΔPmin, then the valve is over-dimensioned. In this case valve with lower ΔPmin or valve with shorter nominal diameter and with lower flow coefficient Kv should be chosen.

4) Flow required across particular valve - in other words what Kv of the valve should be.

There is a direct correlation between the pressure drop (ΔP) across the valve and the actual flow through. The magnitude of the pressure differential depends on, among other things, valve construction, medium type (its density, temperature and viscosity) and volumetric flow rate.

The set of information that is necessary to select the best fitting valve must, as precisely as possible, define all aspects of the application (operation conditions) such as:

Media type, flow required, inlet port pressure, pressure drop across the valve (ΔP) required for the particular application.

Based on the above information we can start valve selection.

There are two ways to approach this issue whether we have Flow Characteristics or Flow Coefficient Kv at our disposal (this data is covered in the valve data sheet).

First method:

We use so-called ***Flow Characteristics*** that graph a correlation between pressure drop ΔP across and volumetric flow rate through the valve for a particular medium (e.g. natural gas or propane-butane). These characteristics are determined for each nominal diameter of the valve for given series of types and presented in one chart.

Procedure: Pick the valve type series based on the pre-defined pressure information we have at our disposal then, having in mind the required flow rate, select from the characteristics the valve and its nominal diameter size that matches the pressure drop across the valve specified for the desired flow rate.

Second method:

We use so-called Flow coefficient Kv in cases when we have no flow characteristics at our disposal - it defines a number of cubic meters per hour of water at a temperature between 5°C and 40°C that will flow through the valve when there is a pressure drop of 1 bar across the valve. This value is being measured by the valve manufacturer and can be found in its data sheet.

Flow coefficient Kv required for the particular application should be defined first. Equations used to calculate this measure are very complicated hence flow charts that make the process of determining flow coefficient Kv more convenient were plotted based on them. Use the below equation to calculate the Kv

$$Kv = (\text{required flow}) \times (\text{graphical coefficient})^{-1}$$

Graphical coefficient can be easily read from flow charts by matching to pressure conditions defined in our data-in. It is essential to correct the final results according to the operating conditions such as media viscosity, temperature, etc.

Procedure: Calculate the flow coefficient Kv based on the above guidelines. Pick the valve type series based on the pre-defined pressure information we have at our disposal then, having in mind the required flow rate, select from the characteristics the valve and its nominal diameter size for which the flow coefficient Kv specified in the data sheet is equal or greater than the previously calculated value.

5) **media and ambient temperature** - as a general rule shall not exceed the range the valve is rated for.
The manufacturer guarantees a long, failure-free operation if operating conditions are constantly maintained at rated temperatures. However, even minimally exceeding these extremes on a longer period of time is unacceptable, as it might lead to drastic shortening of valve lifetime, malfunction (the coil power decreases significantly with the increase of temperature) or even damage. Note that the valve can operate in conditions when the extremes might be exceeded periodically for a short period of time, however, it should be taken into consideration that lifetime might be impacted.

6) **standard voltage** - an appropriate coil as per manufacturer recommendations shall be selected according to the particular application standard voltage value and type

7) **filter** - it is essential to choose an appropriate filter to protect the valve from impurities carried by the fluid, which are the most common cause of solenoid valve failures (due to damage). Some valves that have an integrated filter may be disassembled to clean the internal elements (i.e. equalization and pilot channels).

8) **fluid hammer** - it is strongly recommended to select a valve with a diaphragm for appliances where fluid hammer effect might occur

9) **degree of protection** - electromagnetic valves may be used in places where different grades of dust depositing and moisture danger might occur. Degree of protection (IP grade) of the coil and the whole valve against such elements must at least meet the operating environment conditions

10) **explosion hazardous environment** - solenoid valves, that can be used in such zones, are marked with “Ex" and carry a special design constructional features essential to meet the fundamental requirements of 94/9/EC Directive (ATEX) equipment protection of equipment from potentially explosive atmospheres

We are aware that it may be impossible to cover all the information about solenoid valves in such a short elaboration. However we hope that the following document will be useful and helps in selecting a valve that matches the particular application. In case of any doubts, once again, we would like to encourage you to contact our company. We are happy to provide you additional, more detailed information on any subject shall you need it. Do not hesitate to **send us an email**.