Whether the type selection and design of electric heat tracing products are correct or not is related to whether the whole electric heat tracing system can operate normally and whether it can meet the equipment process requirements.It also involves the investment cost, operation cost, operation quality and service life of the **heat tracing cable** products. Therefore, in the design and selection, not only the actual use effect of the electric heat tracing products, but also the economic cost of the system operation should be considered. Generally speaking, the design principle is reliable, applicable, economical and simple.

1、 Precautions for model selection:

As mentioned above, electric heat tracing is to use the heat generated by electric energy to compensate the heat loss dissipated by the traced pipeline and equipment in the process, so as to meet the requirements of medium temperature in the process. Therefore, the calculation of heat dissipation of pipeline and equipment is the premise of equal heat compensation, and the relevant data must be collected and sorted out. It is best to make correct calculation,The specific steps are as follows:

(1) Collect the external dimensions of the traced body.(such as diameter and length of pipeline, shape and size of tank body, etc.)

(2) The number of external dimensions and accessories of the tank.(such as valve, flange, bracket, liquid meter, etc.)

(3) Local minimum and maximum ambient temperature.

(4) The optimum operating temperature and the maximum or minimum allowable temperature to be maintained by the tracer.

(5) Accidental maximum operating temperature of equipment and pipelines.(e.g. sweeping temperature)

(6) Type and thickness of thermal insulation materials.

(7) What kind of explosion-proof area does the installation environment belong to? It is corrosive environment, indoor, outdoor, overhead, underground or its environment.

(8) Site power supply conditions and environment.(two phase, three phase, power supply capacity, power supply position)

After the above data collection, the normalization table and heat loss formula can be used for specific calculation and selection.

2、 Calculation method:

(1) According to the pipe diameter and insulation layer thickness, the normalized loss factor of pipe shape is found out from the normalized loss factor table.

(2) Find out the value of heat transfer coefficient K (w / m ℃)

(3) The safety factor (deviation factor) is 1.37 to compensate for 10% voltage fluctuation (drop) and 10% resistance rise.

(4) Calculate the temperature difference between the maintenance temperature and the lowest ambient temperature.

(5) The heat loss per meter of the pipeline can be obtained by multiplying the above four items, and the actual power loss per meter can be obtained by multiplying the correction factor of the surrounding environment.

3、 Formula introduction

Heat loss can be calculated directly by the loss formula as well as by the look-up table method.

1Heat loss formula of pipeline

$$Q=\frac{2\pi\lambda(T_V-T_H)}{Ln[(d+2\delta)\div d]}\ (w/m)$$

2Plane heat loss formula

$$Q=\frac{\pi\lambda(T_V-T_H)}{\delta/\lambda}\times S\ (w)$$

3Calculation of heat dissipation of tank
Q=1.2×q×s(w)
Where:
Q: Actual heat loss (w / m, w)
λ: Thermal conductivity of thermal insulation material (w / m ·℃)
TV: maintain temperature (℃)
S: Total plane area or surface area of container (M2)
Th: minimum ambient temperature (℃)
d: Pipe outer diameter (mm)
q: Heat dissipation per square meter (see table 7-3)
δ: Thickness of insulation material (mm)
Note: the unit of δ in formula (2) should be changed into the unit of M
4Calculation formula of heating temperature rise per meter of pipeline:
Q plus = (C1 × M1 + C2 × m2) × (ts-th)
P Plus = q plus / 860
P total = P Plus + P companion
Where:
Q plus: heat absorption per meter of pipe (kcal)
C1: specific heat of pipeline material (kcal / kg ·℃)
C2: specific heat of medium (kcal / kg ·℃)
M1: pipe mass (kg)
M2: mass of medium (kg)
TS: heating target temperature (℃)
Th: minimum ambient temperature (℃)
Note: the above calculation formula is in the state of medium static condition (no flow)
5Calculation formula of tank (container) heating
Q plus = C3 · m3 × (TS th)
P Plus = q plus / 860
P total = P Plus + P companion
Where:
Q plus: heat absorption capacity of the container (kcal)
C3: specific heat of vessel material (kcal / kg ·℃)
M3: container capacity (kg)

TS: target temperature of heating vessel (℃)
Th:: minimum ambient temperature (℃)
Note: the above calculation formula is the static condition of medium. If there is medium temperature rise, the formula is: Q plus = C × m ×△ t

4、 Calculation example:

There is a steel chemical pipeline with a diameter of 4 "and a length of 100 meters, including 2 ball valves and 5 pipe brackets.It needs to maintain the temperature of 60 ℃, glass fiber insulation, thickness of 50 mm, local minimum ambient temperature of - 20 ℃, corrosive gas around, power supply voltage of 220 V, and calculate the heat loss per meter and total load of the pipeline.
Steps:

A. According to the above technical conditions, the normalized loss factor table is used for calculation, and the loss factor is 9.88 after looking up the table. In addition, the heat transfer coefficient of thermal insulation material shows that glass fiber λ = 0.036.

B. Heat loss per meter of pipe q = 9.88 × λ× [60 - (- 20)] × 1.37 = 38.89w/m

C. Calculate the heat loss of ball valve and bracket

Q ball valve = 0.8 × heat loss per meter of pipe Q (heat loss per piece)
=0.8×38.98
=31.18w

Q = 3 × heat loss per meter of pipe (loss per bracket)
=3×38.98
=116.94w

D. Calculate the total load of pipeline

Considering the standardization of product selection, the closer standard power (upward) is generally selected. Therefore, 38.98w/m is close to 40W / m, so this data should be included in the calculation of total conformity: Q total = q pipe + Q valve + Q bracket
=100 ×40+2×31.18+5×116.94=4000+62.36+584.7+4647.06w

E. Determine the final length of the tracing zone

Ltotal = 10.5 × qtotal / 40 = 1.05 × 4647.06 / 40 = 116.17m, take 117m

Note: 1.05 is the installation factor of the length of the tracing strip, so the service length of the tracing strip is determined to be 117m.

5、 Type selection

In the specific selection, the surrounding environment and technical requirements of the heat tracing system, as well as the performance index of the product, should be considered. The selection is based on the principle of economy, applicability and optimal distribution. In this case, the single-phase constant power of 40W / M is selected according to the product performance index and the actual calculation results,Considering the corrosive environment, it is better to use the reinforced type, so the model rdp2 (q) - j3-40 is more suitable.
The above selection is not the only one. It is mainly based on the premise of optimal distribution and economic applicability, and flexible selection methods. If you have any doubt in the selection, please contact our technical department at any time, so that the selected products can really meet the actual process requirements.The heat tracing design and selection method of tank and other equipment are consistent with the above design and selection principles, and will not be repeated here.

In addition: if the pipe diameter D is changed according to the above conditions to increase the heat tracing power to 60W / m, and the power of tracing band is 40W / m, then the length of tracing band to be wound for each meter of pipe is L = 60 / 40 = 1.5, that is, the winding coefficient is 1.5, and the general installation principle is to lay one meter tracing band directly for one meter of pipe or to be a multiple of one meter.

Configuration of accessories of Electric Tracing Band:

The specific configuration method of the accessories of the whole electric heat tracing system is as follows:

a. Generally, each small system is equipped with a power box, a temperature controller, two-way box or three-way box. Generally, the two-way box is about 100 meters, and the three-way box depends on how many branches there are in the pipeline. Generally, each branch is equipped with one, and the terminal is equipped with one depending on how many tails of the tracing belt there are.

b. Generally, the length of the aluminum tape is about 1.2 times of the total length of the heat tracing belt, and it is configured in 50m times.

c. The pressure sensitive tape is configured according to the outer diameter D and length of the pipe, and the specific quantity is L = pipe length × 0.8 × 5D, which is configured in the multiple of 20m.

d. The length of the steel strip depends on the outer diameter D of the pipe and the number of junction boxes, specifically L = 2.5D × the number of junction boxes (Note: except one for the terminal, all other boxes are two)

e. The number of steel strip screws is twice that of junction box.

According to the previous example, the number of accessories is 1 power box, 1 middle junction box (standby), 1 end box, 1 temperature controller, and 150m aluminum tape (L = 117 × 1.2 = 134m, take 150m)

The pressure sensitive strip is 40m (L = 100 × 0.8 × 5 = 40m), and the steel strip is 4m (L = 2.5D × 3 + 1 = 4m)

There are 7 pairs of steel belt screws

● device of distribution box:

The power distribution of the heat tracing system should be determined according to its total load and the number of circuits of the subsystem, and carried out according to the relevant electrical distribution design, specifications and requirements, and considering its due functional protection, such as leakage, overload, short circuit, temperature control, etc.According to the example, the distribution capacity should be p = 1.6 × actual capacity = 1.6 × 4647w = 7500w, that is, the distribution box with 40A intermediate contactor and single circuit 7.5kW, 220V voltage can meet the requirements.