



2、计算法

$$D_n = 594.5 \sqrt{\frac{G}{W}} \quad (\text{mm}) \quad (1)$$

$$\text{或 } D_n = 18.8 \sqrt{\frac{Q}{V}} \quad (\text{mm}) \quad (2)$$

式中 D_n 管子内径 / mm,

G 介质的流量 / t/h

V 介质的比容 / m³/kg

W 介质的流速 / m/s

Q 介质的容积 / m³/h

3、计算示例

某厂采暖面积7000 m², 蒸汽压力0.4MPa_g, 计算蒸汽主管直径 D_n ,

(1)查表法

查蒸汽管道口径选定表, 蒸汽压力0.4MPa_g, 北方采暖用汽按经验值为1.5 kg/h·m², 采暖面积7000m², 需蒸汽7000 × 1.5 = 10500 (kg/h) = 10.5t/h。

因流速40m/s, 容量12661kg/h, 对应蒸汽主管DN200;

流速25m/s, 容量12225kg/h, 对应蒸汽主管DN250;

流速15m/s, 容量10358kg/h, 对应蒸汽主管DN300;

故, 应选公称尺寸DN200~DN300。

(2)计算(概算法)

2.1按公式(1) $D_n = 594.5 \sqrt{\frac{G}{W}}$ 计算:

因 $G = 7000 \text{m}^2 \times 1.5 \text{kg/h} \cdot \text{m}^2 = 10500 \text{kg/h} = 10.5 \text{t/h}$,

V 查蒸汽性质表, $V_s = 0.37481 \text{ (m}^3/\text{kg)}$

查《热力管道设计安装手册》热力管道常用流速表, 饱和蒸汽, $DN > 200, W = 30 \sim 40$; $DN 100 \sim 200, W = 25 \sim 35$; $DN < 100, W = 15 \sim 30$, 取 $W_1 = 40 \text{m/s}$, $W_2 = 25 \text{m/s}$, $W_3 = 15 \text{m/s}$ 计算如下:

$$D_{n1} = 594.5 \times \sqrt{\frac{10.5 \times 0.37481}{40}} = 186.5 \text{ (mm)}, \text{ 选取 DN200,}$$

$$D_{n2} = 594.5 \times \sqrt{\frac{10.5 \times 0.37481}{25}} = 235.9 \text{ (mm)}, \text{ 选取 DN250,}$$

$$D_{n3} = 594.5 \times \sqrt{\frac{10.5 \times 0.37481}{15}} = 304.5 \text{ (mm)}, \text{ 选取 DN300.}$$

2.2按公式(2) $D_n = 18.8 \sqrt{\frac{Q}{V}}$ 计算:

$Q = G \cdot V = 10500 \text{ (kg/h)} \times 0.37481 \text{ (m}^3/\text{kg)} = 3935.5 \text{ m}^3/\text{h}$

取 $W_1 = 40 \text{m/s}$, $W_2 = 25 \text{m/s}$, $W_3 = 15 \text{m/s}$,

$$D_{n1} = 18.8 \times \sqrt{\frac{3935.5}{40}} = 186.5 \text{ (mm)}, \text{ 选取公称尺寸 DN200,}$$

$$D_{n2} = 18.8 \times \sqrt{\frac{3935.5}{25}} = 235.9 \text{ (mm)}, \text{ 选取公称尺寸 DN250,}$$

$$D_{n3} = 18.8 \times \sqrt{\frac{3935.5}{15}} = 304.5 \text{ (mm)}, \text{ 选取公称尺寸 DN300.}$$

4、计算分析结论

该厂各煤采暖管道现有供汽主管公称尺寸为DN100, 查蒸汽管道口径选定表, 饱和蒸汽0.4MPa_g, 采用大流速40m/s, 对应最大容量(流量)为3120kg/h, 远小于采暖需要的经验计算值10500 kg/h, 建议有必要更换为公称尺寸DN250供汽主管。