CH0302 Process Instrumentation

Lecture 13 – Flow Measurements

Department of Chemical Engineering
School of Bioengineering
SRM University
Kattankulathur 603203

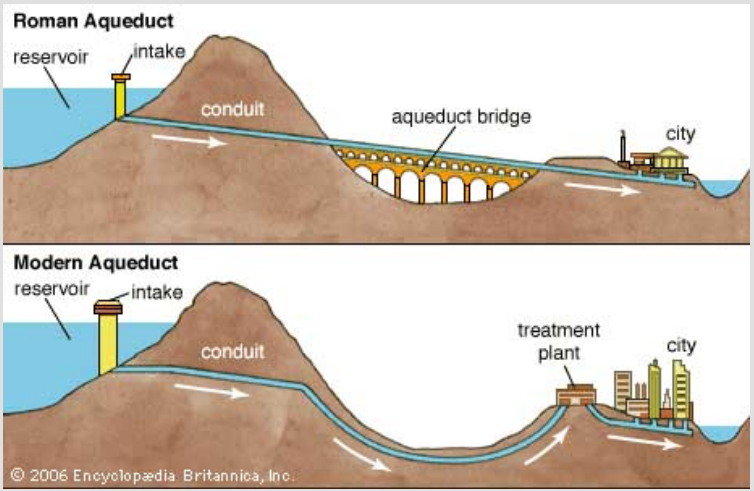
Introduction – Flow Measurements

- Flow Measurements
- Classification of flow measuring instruments
- Various configurations for flow measurement

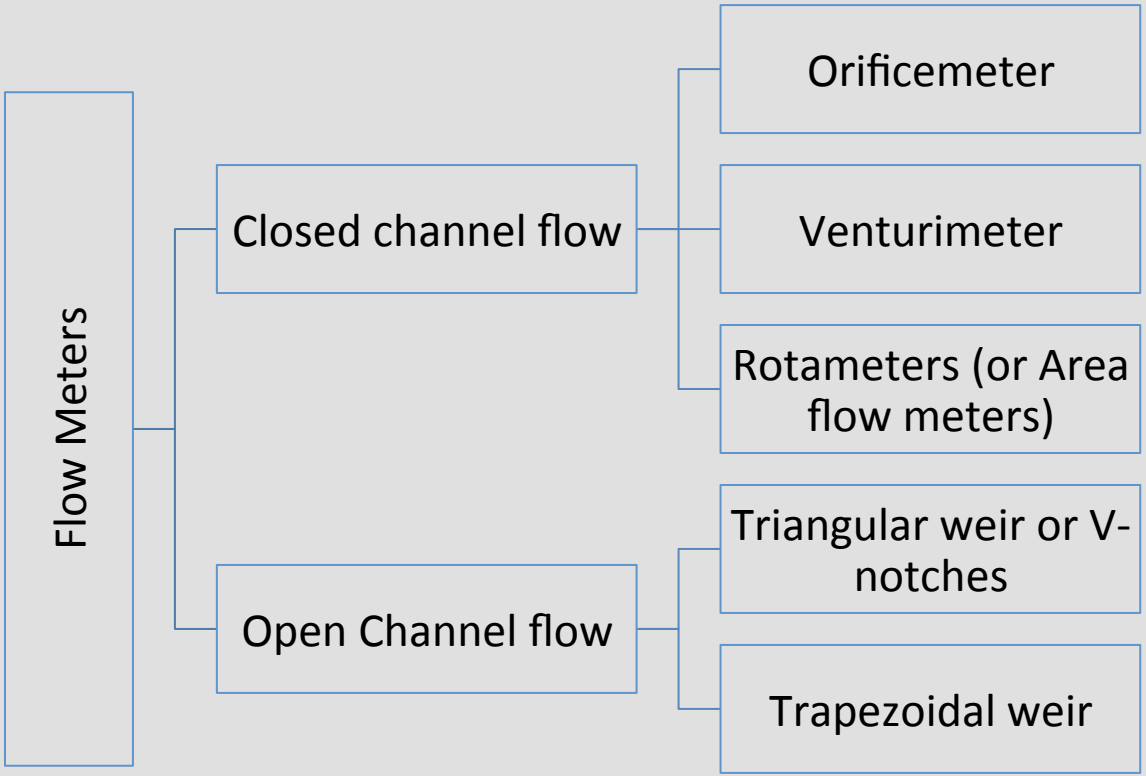
Flow Measurement

- The measurement of flow rate and flow quantity of materials is made primarily for the purpose of determining the proportions of materials introduced in the manufacturing process.

- Measurement of flow rate and quantity is the oldest art in the science of instrumentation and it dates back to great hydraulic and public works of romans

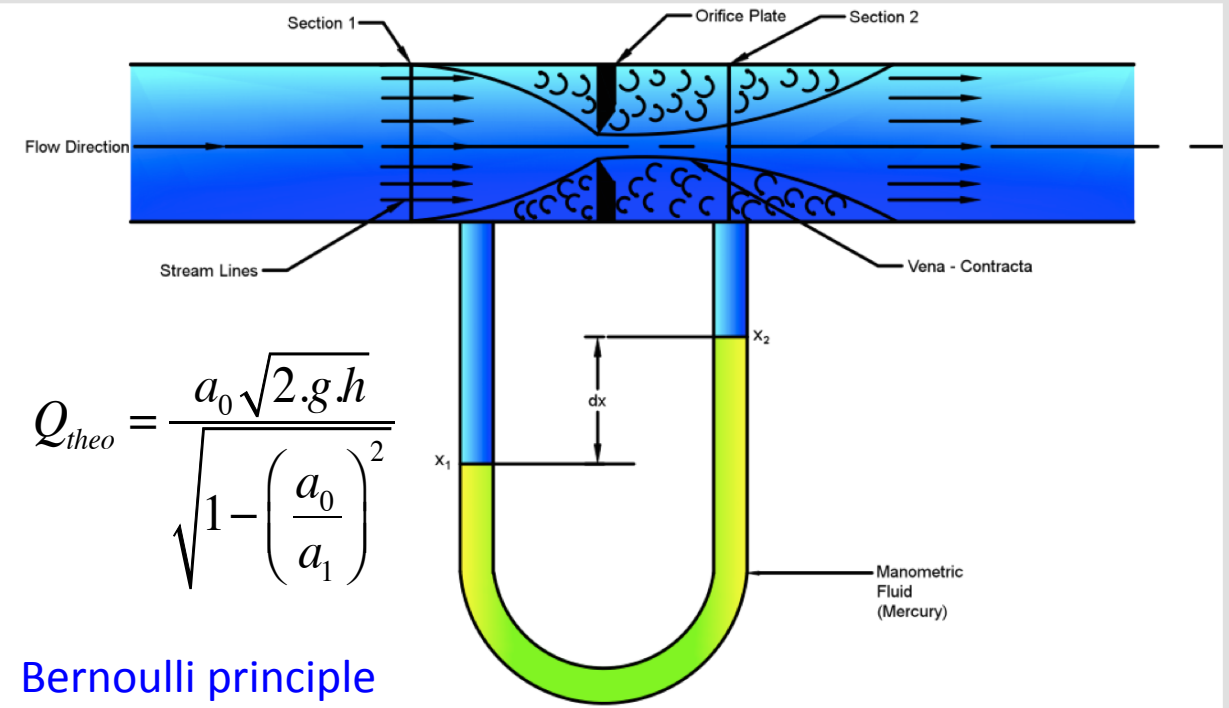


Classification



Configurations

Orifice meter



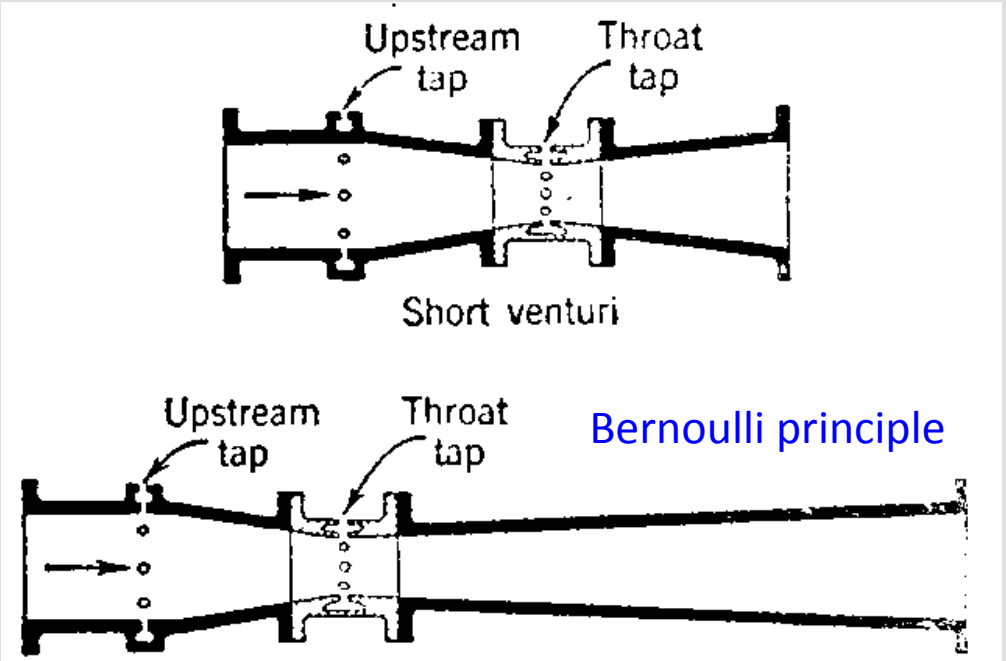
$$Q_{theo} = \frac{a_0\sqrt{2.g.h}}{\sqrt{1-\left(\frac{a_0}{a_1}\right)^2}}$$

Bernoulli principle

Configurations

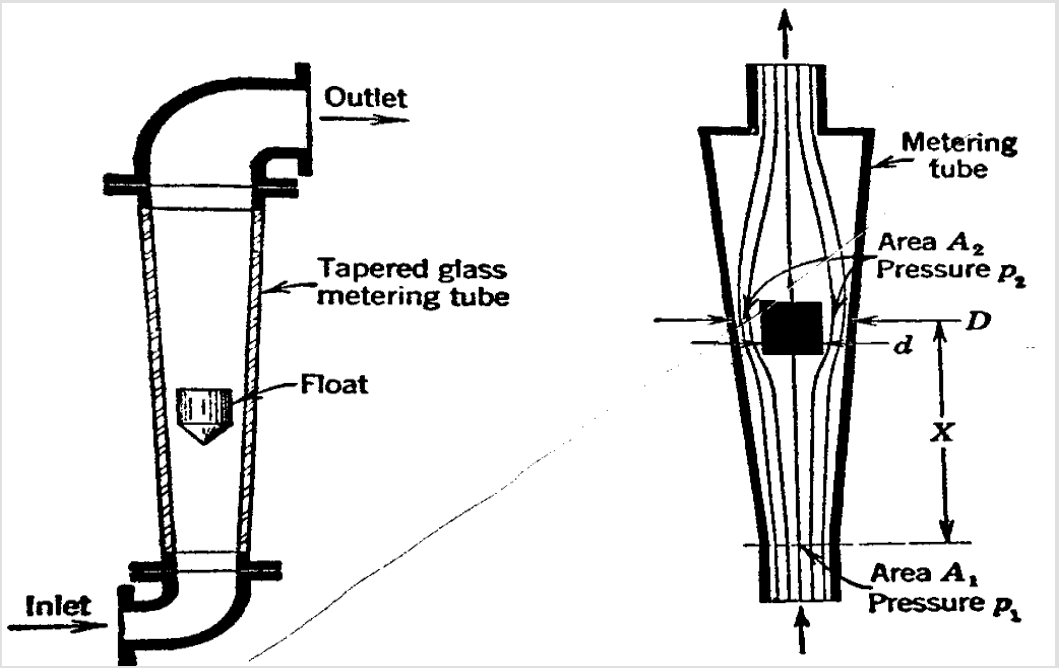
Venturimeter

$$Q_{actual} = \frac{a_1 a_2 \sqrt{2gh}}{\sqrt{a_1^2 - a_2^2}}$$



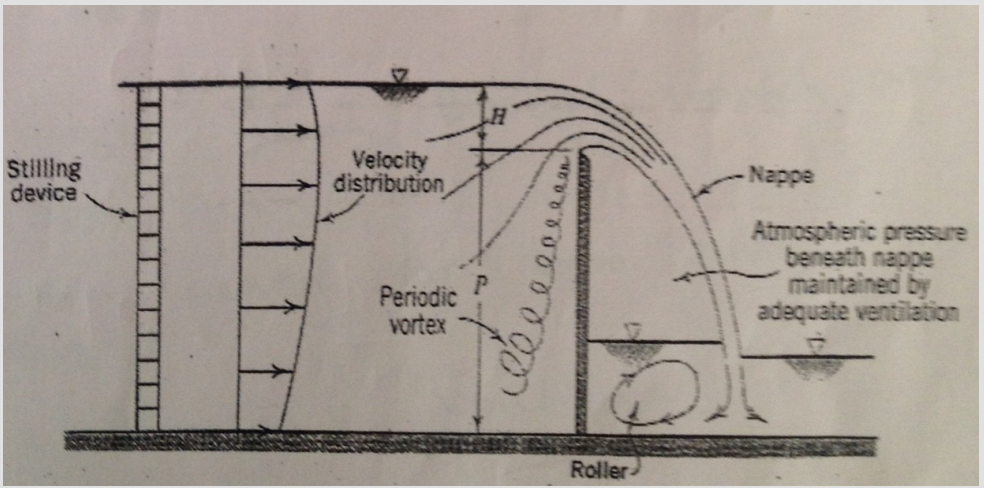
Configurations

Rotameters



Configurations

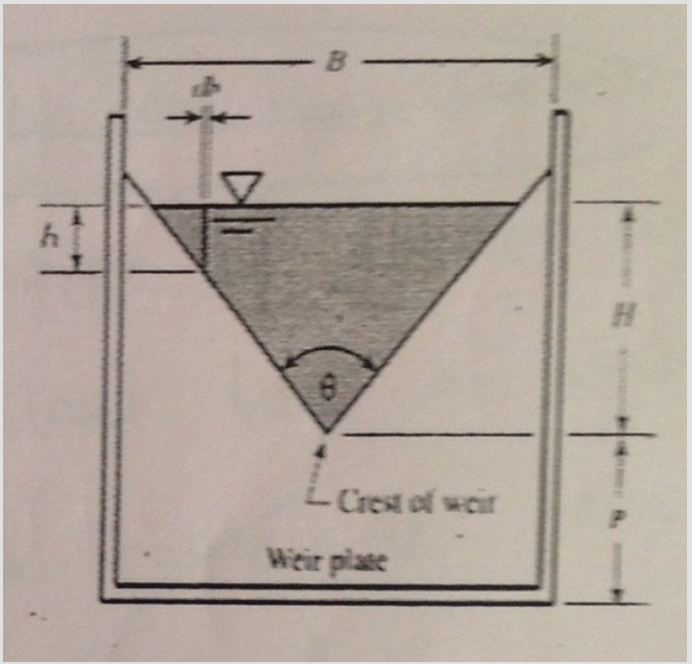
Velocity distributions in weirs



Configurations

V-Notch (Triangular weir)

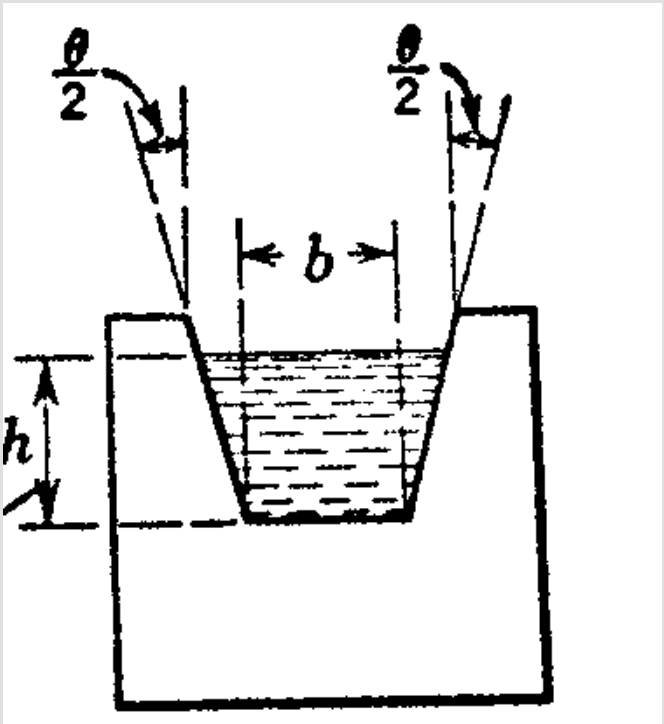
$$Q_{theoritical} = \frac{8}{15}\tan\frac{\theta}{2}\sqrt{52g}\times h^{\frac{5}{2}}$$



Configurations

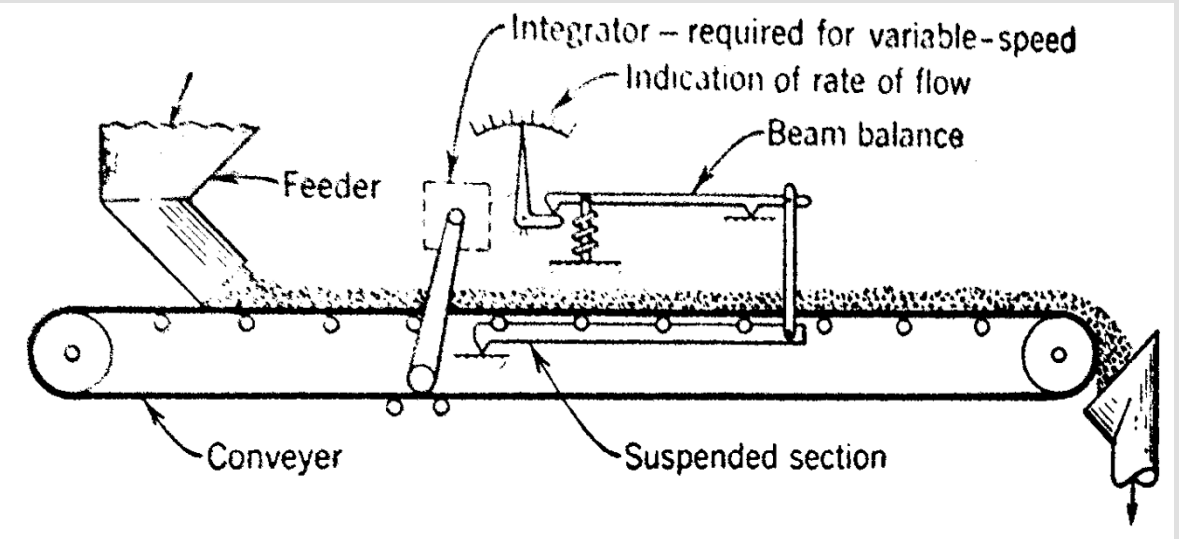
Trapezoidal weir

$$Q_{actual} = \frac{2}{3} b\sqrt{2h^3}$$



Configurations

Flow of dry materials



References

1. Donald P. Eckman, (2004) *Industrial Instrumentation*, CBS Publishers, Pp. 1- 27.

Thank You