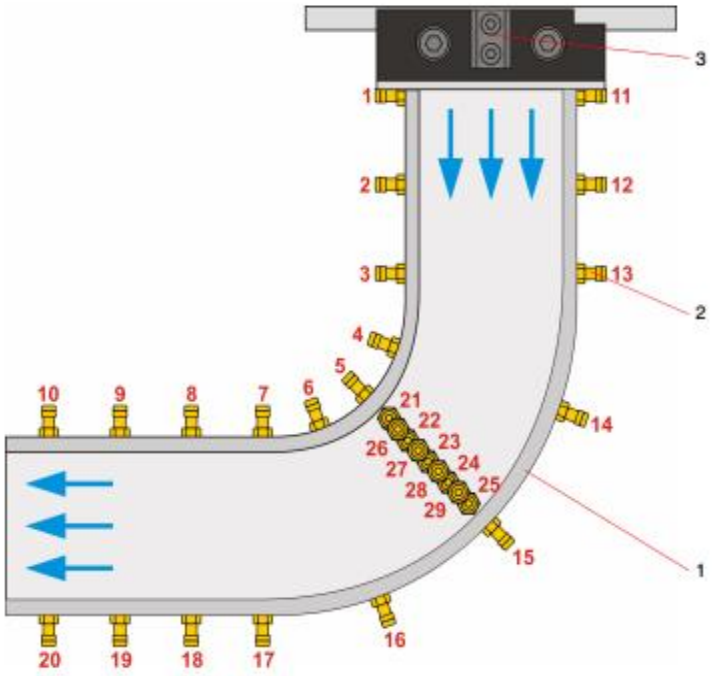
Construction of materials Lab.

Name of experiment: Flow in a Pipe Bend

Experiment No.: 1

Experiment objective: Investigating the pressure distribution of the flow in a pipe bend.

Description of the devies :



1	Housing
2	Measuring gauges
3	Clamp fastener seat

Measuring point 1 to 10	Internal bend
Measuring point 11 to 20	External bend
Measuring point 21 to 25	Right side
Measuring point 26 to 29	Left side

Fig.1 Design of the HM 225.05 (side view)

Procedure:

1. One by one, connect the following measuring points with the manometer tubes of the HM 225 trainer.
   • Measuring point 1 to 10 at the internal bend of the pipe bend
   • Measuring point 21 to 24 on the right side of the pipe bend
   • One manometer tube remains open, i.e. it is not connected to a measuring point. The reference pressure head (h_{ref}) is measured here.

2. On the HM 225 trainer:
   • Open valve V1 fully.
   • Close valve V2 fully.
   • Set a high flow velocity (potentiometer 8...10).
   • Switch on the fan

3. Read the pressure heads on the manometer tubes and note them on your worksheet.

4. Switch off the fan.

5. Repeat the experiment with the same potentiometer setting and the following measuring points
   • Measuring point 11 to 20 at the external bend of the pipe bend
   • Measuring point 25 to 28 on the left side of the pipe bend.
   • One manometer tube remains open, i.e. it is not connected to a measuring point (reference pressure head h_{ref}).

Calculation:

From the measured pressure heads (*h*), calculate the static pressures (*p stat*):

$$p_{stat\,i} = h_{ref} - h_i \qquad \text{.....eq (1)}$$

Non-dimensionless the static pressures

using the maximum static pressure (as

absolute value, without regarding the sign).

$$p^*_{stat,\,i} = \frac{p_{stat,i}}{|p_{stat,max}|} \qquad \text{..... eq (2)}$$

Positive values are positive pressures, negative values are negative pressures.

The value 1 corresponds to the maximum static

pressure (*p stat, max)*.

List of formula symbols and units

Formula symbols	**Mathematical/physical variable**	**Unit**
h	Pressure head	mm WC
h ref	Reference pressure head	
P stat	Static pressure	
P stat, i	Static pressure at measuring point *i*	
P stat, max	Maximum static pressure	
P^* stat, i	Static Pressure at measuring point *i* (dimensionless)	–

Abbreviation	**Meaning**
WC	Water column

Worksheet 1: Measuring values

Potentiometer setting:					
Area of the pipe bend	**Measuring point no.**	**Connected to manometer tube no.**	**Pressure head mm WC**	**P static**	**Static pressure p^* stat**
Internal bend	1				
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10				
Right side	21				
	22				
	23				
	24				
	25				
h *ref*	---				
External bend	11				
	12				
	13				
	14				
	15				
	16				
	17				
	18				
	19				
	20				
Left side	26				
	27				
	28				
	29				
h Ref	---				

Questions and Answer

1. Draw the curve between static pressure (P^* stat.) of the right & left side with internal radius of the bend.
2. Discuss results that are obtained from the experiment. Also explain the curve.