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Experimental study of separation of two-phase flow gas-liquid

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A gas-liquid separation process have been investigated experimentally in an installation which designed by combining horizontal and vertical pipes of same diameter forming T-junctions was tested in a closed loop with controlled performances as a function of parameters such as: the number and height of the vertical junctions, the test conditions (the flow rate of liquid and the fraction of gas fed). The plant is equipped with sampling equipment for each phase to monitor the process and analyze it until the separation progresses efficiently. The results obtained are recorded at the optimum separation of the flow. At the same flow rate, the variation interval of the void fraction increases with increasing flow pressure; for 2 *bar*, α varies between 0,76 and 0,96, for 3 *bar*, it varies between 0,66 and 0,95, finally for 4 *bar* it varies between 0,54 and 0,94. The manufacturing simplicity and the low cost of this installation make it favorite solution for industrial applications.

Nomenclature

A_T : Total section of test pipe, [m^2]
A_G : Section occupied by the gas phase, [m^2]
A_L : Section occupied by the liquid phase, [m^2]
A_i : Test sections, [m^2]
G_M : Mass flow of mixture, [$m^3/s/m^2$]
G_G : Mass flow of gas, [$m^3/s/m^2$]
G_L : Mass flow of liquid, [$m^3/s/m^2$]
J_M : Volume flow of mixture, [$kg/s/m^2$]
J_G : Volume flow of gas, [$kg/s/m^2$]
J_L : Volume flow of liquid, [$kg/s/m^2$]
Q_M : Volume flow rate of mixture, [m^3/s]
Q_G : Volume flow rate of gaz, [m^3/s]
Q_L : Volume flow rate of liquid, [m^3/s]
Q_{Len} : Flow rate of the supply liquid, [m^3/h]
W_M : Total flow rate, [kg/s]
W_G : Gas mass flow rate, [kg/s]
W_L : Liquid mass flow rate, [kg/s]
v_G : Superficial velocity of the gas phase, [m/s]
v_L : Superficial velocity of the liquid phase, [m/s]
x : Gas-liquid mixture ratio
α : Two-phase void fraction
ρ_M : Mixture density, [kg/m^3]
ρ_G : Gas density, [kg/m^3]
ρ_L : Liquid density, [kg/m^3]

1. Introduction

The two phase flow, used in many industrial applications, always encounters the T junctions dividing the flows as they pass through the systems. The efficient separation of the gas-liquid two phase flow, which is highly sought after in the industry, is carried out for the transport of two-phase fluids in the T-junctions made up of pipes which can take different dispositions. This process is widely disseminated in the gas, petrochemical, nuclear, food and other industries. The process is carried out by means of installations which, in shape and dimensions, depend essentially on the characteristics of the flowing fluids, whereas conventional systems are affected by complicated installations of costly manufacture and drastic maintenance.

The gas-liquid two-phase flow establishes in T branched pipes separates in phases of unequal qualities in those branches. This separation occurs in the asymmetric region near the branches, due to the (lighter) gas phase which can take its direction more easily than that of the liquid. However, the actual degree of phase separation in a branch is generally affected by other factors such as the phase distribution (flow regime) and the branch side orientation. A brief summary of the literature on the two phase flow through the T junctions reveals that a significant amount of recent research has been devoted to this subject. Reviewing some of the works using this type of junctions allows to understand the different aspects of the problem and to show that they can be used to optimize the gas-liquid separation process.

Phase separation phenomena in branching conduits was successfully analyzed by Lahey [1] using phenomenological dividing "streamline" models and multi dimensional two-fluid models but significantly more research is needed before reliable predictive techniques are available. In particular, both analytical approaches require a specification of the inlet flow regime.

Detailed experimental data on dividing steam-water annular flow in T-junctions having horizontal inlet and downwardly inclined branches were obtained by Peng et al. [2]. The branch orientation is a significant parameter of the phase redistribution whose characteristics have been compared with the available models.

Roberts et al. [3] presented experimental results for the phase split which occurs at a T-junction made up of pipes all on the same horizontal plane. A new phenomenological model is presented to determine phase split of low liquid hold-up semi-annular flow and predictions compared with measurements from this present study.

Walters et al. [4] presented experimental data for the phase distribution and junction pressure drops of air-water mixtures in two reduced tee junctions. The tested range corresponds to inlet flow regimes of stratified, wavy and annular for both test sections plus slug for the larger-branch test section. Comparisons are made between the present data and existing models of pressure drop and phase distribution, thus identifying the models whose applicability can be extended to the present conditions.

Bevilacqua et al. [5] have designed an installation with ascending T junctions at different typologies. The results of the collected experimental data show that the better separation system configuration is strictly linked to the performance required to the separation device; the separation section in-fact behaves like a facility that performs not only a simple division of the inlet flow rate between the two outlet branches but modifies the inlet flow rate void fraction.

Experiments and interpretations are carried out by Giuseppe [6] in two experimental rigs, one with a horizontal main pipe and the other with a vertical main pipe. Comparison with predictive models is do for the horizontal geometry. For the vertical main pipe experiments, interpretation and semi-empirical correlations are proposed to fit a large data base including the present data and previous findings.

Stacey et al. [7] extend the range of diameters for which information on the maldistribution of the phases at a T-junction is available. The data are compared to those from larger diameter junctions for similar superficial inlet velocities, it is seen that decreasing the pipe diameter increases the fraction of liquid taken off due to the lower entrained fraction and more uniform film for smaller pipes.

The main objective of Wren [8] was to gain a better understanding of how a gas-liquid flow is divided into a large diameter T-junction and how the split of the flow is affected by the geometry of the junction. The experimental investigation was expanded to incorporate the effect of placing two regular T-junctions in series.

Van Grop [9] explored the effect of pressure on the phase distribution at a reduced tee junction. This was done by conducting experiments on one of the junctions tested by Walters et al. using air–water mixtures and nearly the same superficial velocities of gas and liquid at junction inlet. For some characteristics, the input phases do not distribute themselves identically between the branches.

A model is developed by Ottens et al. [10] to calculate the transient behavior of co-current gas-liquid flow with small liquid holdup through a horizontal regular T-junction. This model combines transient two-phase pipe flow and gas-liquid flow splitting in a T-junction.

Wang and Shoji [11] found that there is a wide fluctuation in both differential pressure and gas flow rate downstream at every extraction ratio (W3/W1) and the fluctuation intensity increases as W3/W1 increasing. It is also made clear that increasing either water superficial velocity or gas superficial velocity in inlet causes fluctuation to become more intensive.

Baker [12] tested a series of optimisation experiments produced the final T-junction configuration. This comprised of two horizontal T-junctions placed in series, the first with a vertically upwards side-arm, the second with a vertically downwards one. The results indicate that in general the T-junction responses are analogous to those observed in a pipe. However, the existence of pipe branches adds another level of complexity as the flow splits exhibit a very non-linear nature.

Das & al. [13] studied phase split at a horizontal T-junction with main and side branches. Results were compared with those reported for larger T-junctions. The side arm take-off tends to be richer in the gas phase with increase in pressure under all flow conditions.

Mak et al. [14] reported measurements and observations of the phase split occurring at a small diameter vertical T-junction. It is shown through comparisons with the work of Stacey et al. [14] in a horizontal T-junction of a similar size that the orientation of the junction has no influence on the flow split.

Pressure-drop and phase-distribution data were tested by El-Shaboury et al. [15] for air-water flows in a horizontal impacting T-junction. In general, it was found that the phases did not distribute themselves evenly between the two outlets unless the mass split is equal. There is a serious lack of data in the literature on two-phase pressure drop in impacting T-junctions and therefore, the present data add substantially to existing data.

Bertani et al. [16] performed an experimental investigation of dividing flow rates and pressure drops in a T-junction with horizontal inlet, run, and branch sides using air-water mixtures. The flow loop was supplied with compressed air and water through a mixing tee. Pressure drop test results across the inlet and branch pipes have been compared with predicted ones. A new pressure drop correlation have been derived from test data.

Yang et al. [17] have used air and water as working fluids with a simple T-junction and with multi-tube T-junction separators with a horizontal main pipe and vertically upward branches. the separation efficiency of the two phases for any multi-tube T-junction separator is much higher than that of the corresponding T-junction. Increasing the number of the connecting tubes can improve the phase separation. complete separation of the two phases can be achieved by the multi-tube T-junction separator.

Mo et al. [18] designed and constructed five separator units for liquid-gas separation used in innovative liquid-vapour separation condensers. The phase separation characteristics were investigated. The liquid height, flow rate through the separation hole, and separation efficiency increased when the header diameter increased and the diameter of the separation hole decreased.

Using air and water as the working fluids, phase separation phenomena for stratified and plug flows at inlet were investigated experimentally by Yang et al. [19], at a simple T-junction and specifically designed multi-tube T-junction separators. The separation efficiency of the two phases for any multi-tube T-junction separator is much higher than that of the simple T-junction. Increasing the number of connecting tubes in the multi-tube T-junction separator can increase the separation efficiency.

In summary, the first studies deal with the non-homogeneous separation of the liquid and gaseous phase, which is absolutely avoided in most industrial applications. Many works have studied T-junctions in horizontal [1, 9, 3, 7, 10, 13, 15] and vertical [11, 14] layout, with different pipe diameters and orientations [15] and for various flow conditions: laminate, corrugated, dispersed and plugged or annular [19].

Sun et al. [20] experimented a two-phase flow to examine behaviors of phase distribution under effect of branch channel diameters in horizontal micro-impacting T-junctions by using Nitrogen and water as working fluids. They found that the uniformity of phase distribution improve if branch channel diameters decrease.

Two-phase flow separation based on visualization is experimented in a vertical header of micro-channel heat exchanger by Li and Hrnjak [21]. They gave their results as vapour and liquid separation efficiencies. The best separation of phases attained if liquid upward momentum or the vapour are reduced and decreasing liquid and vapour interaction.

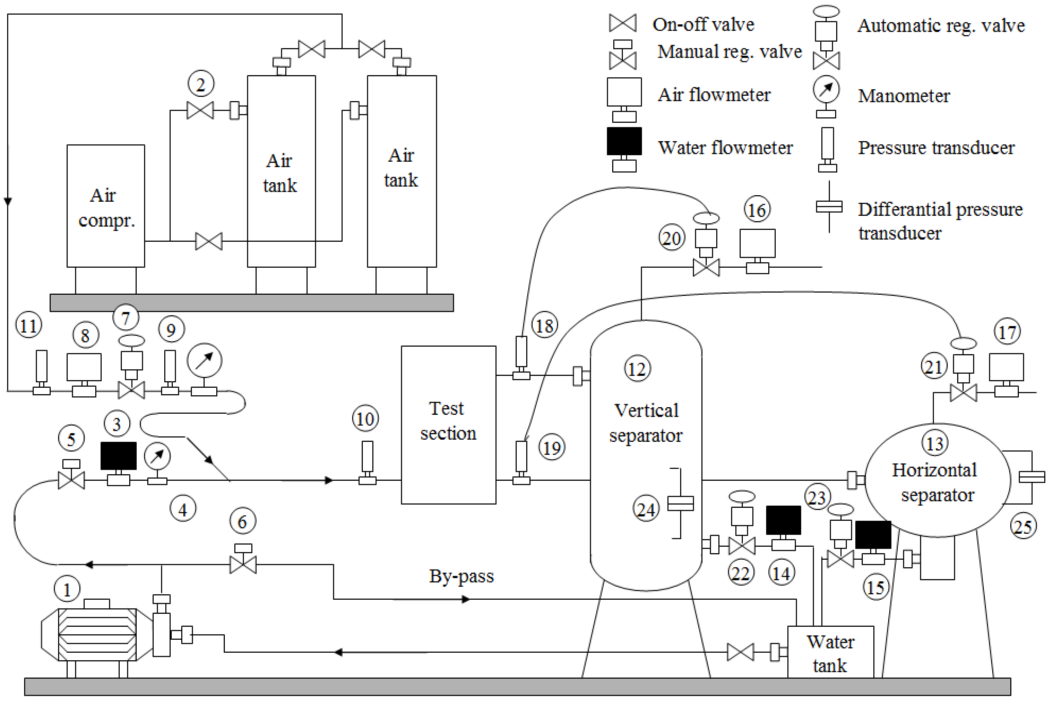
The objective of our study aims to evaluate the performance of an optimal gas-liquid separation by a T-junctions separator with vertically arranged pipe elements.

2. Description of the plant and test procedure

The experimental plant studied consist a combination of upward and downward vertical junctions acting as gas-liquid phase separators (Fig. 1). It is equipped with a test loop composed of different parts organized in an order that allows to compare geometric configurations. A calibration is carried out to adjust and analyze conditions of the flow in the loop through the junctions T. In order to evaluate the performance of this design, several configurations are tested during the flow by changing number and height of T-junctions and flow rate of liquid.

The gas and liquid streams are generated by a pumping system (1) for water and compressor (2) air for. After proper transport, they mingle with the Y-junction to obtain the right mixture. The flow rate of the liquid stream and its pressure are controlled by the magnetic flow meter (3) and the pressure apparatus (4) via the manual valves (5) and (6). The intake air is adjusted by the pneumatic valve (7) connected to the output signal of the vortex flow meter (8) of the air flow to the pressure transducer (9). A horizontal length of 5 m of conduit is inserted between the Y junction and the test section for the stability of the mixture. The value of air flow rate tracked by the flowmeter (8) to the pressure value of the transducer (11) must be adjusted to the correct pressure value of the transducer (10), before the test section. The separators (12) and (13) allow a perfect separation of the phases coming from the two straight and deflected branches of the junction; consequently, the magnetic flow meters (14) and (15) for water and (16) and (17) for air give a precise value of the flow rate. The display of the pressure value in the test section is obtained by regulating the backside pressure imposed on the water and air tanks. The regulation system for discharging the flow of tanks is formed by pressure transducers (18) and (19) connected to the automatic regulating valves (20) and (21) for air, and differential pressure transducers (24) and (25) connected to the automatic water regulating valves (22) and (23).

During the tests in industrial installations, the plug flow conditions are the most encountered, which poses many problems for pipe fittings such as the valves and the separators. Dimensions of the pipes in the test sections were chosen in order to obtain a superficial velocity for the two streams, liquid and gaseous, required for the flow conditions. The pipe diameter used is 53.5 *mm*, the maximum value of the test pressure is 4 *bar*, the maximum water flow rate is about 40 m^3/h and the permitted air pressure is of 450 Nm^3/h, allow maximum values of the surface velocity of 3.7 *m*/*s* for water and 11 *m*/*s* for air. Preliminary tests have been carried out to validate these hypotheses, according to the well-known diagram of Mandhane et al. [4].



(**1**) Pumping system, (**2**) Compressor, (**3**) Magnetic flowmeter, (**4**) Pressure gage, (**5**),(**6**) Manual valves, (**7**) Pneumatic valve, (**8**) Vortex flow meter, (**9**),(**10**) Transducers, (**11**) Transducer, (**12**),(**13**) Separators, (**14**),(**15**) Magnetic flow meters, (**16**),(**17**) Vortex meters, (**18**),(**19**) Transducers, (**20**),(**21**) Automatic regulating valves, (**22**),(**23**) Automatic regulating valves, (**24**),(**25**) Differential pressure transducers.

Figure 1: Scheme of the experimental plant.

Flow regimes were established for some experimental characteristics available in conformity with the maps of Issa and Oliveira. The combined separator shown in the scheme of figure 2 is composed of three ascending branches T equipped with valves. Another manual control valve is placed on the pipe to exactly adjust the discharge valve along the circuit.

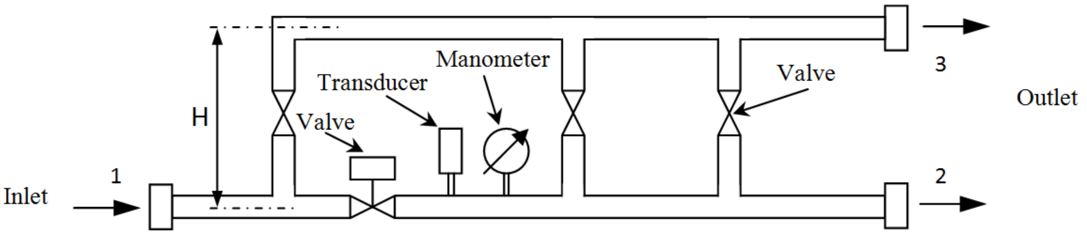


Figure 2 : Scheme of the combined separator.

There are two configurations, one high with a height H = 1.4 *m* and the other low with H = 0.7 *m*. At the beginning, each of them is tested with a gradual opening of the valve in the vertical branch then two of the three branches and finally all three will be all open. Thus we obtain six different configurations: high 1, 2, 3 and bass 1, 2 and 3. The separation performance is measured by the mass ratio between the inlet and the T of separation for each phase. The ratio W_{L2}/W_{L1} (or alternatively W_{L3}/W_{L1}) gives the mass fraction of the liquid along the branch 2 of the right T (or along the deviated branch 3) compared to the total mass of the input liquid along of branch 1. The same consideration is made for the gaseous phase relative for the ratio W_{G2}/W_{G1} (or W_{G3}/W_{G1}). The highest performances corresponding to perfect separation can be obtained by changing: the number of branches, the height H, the supply flow rate Q_{Lin} and the void fraction α of the inlet stream. A manual control valve is placed on the pipe in order to adjust the appropriate pressure along the circuit. The two different configurations relating to the height H of the vertical T-junctions were compared. Each of them was examined by gradually opening the valves of the vertical T's (only one, at the beginning, then two and finally all the open T's), obtaining six different configurations designating "high 1", "high 2" , high 3 "," low 1 "," low 2 "and" low 3 ". The separation efficiency is measured by a mass ratio between the inlet and the T junctions of separation for each phase. The W_{L2}/W_{L1} ratio (or alternatively W_{L3}/W_{L1}) gives the mass fraction of the liquid along the right branch 2 (or along the branch 3) compared to the total mass of the liquid along the inlet branch 1. The same consideration hap for the gas phase with the ratio W_{G2}/W_{G1} (or W_{G3}/W_{G1}). The perfect separation is reached when the values of the two ratios are respectively 1 (or 0) and 0 (or 1). During the tests the separation efficiency was monitored by changing the number of junctions T, their size H, the volume flow rate of the supply liquid Q_{Lin}, and the void fraction α of the inlet stream.

3. Governing equations

Calling the characteristics of some simple parameters for phase separation are used. Characteristics of some simple parameters for phase separation are used.

Let's define the quantities used in two-phase flow in the following way: the mass flow rates of the gas W_G and the liquid W_L defined by:

$$W_G = \rho_G v_G A_G \tag{1}$$

$$W_L = \rho_L v_L A_L \tag{2}$$

The mass flow is given by:

$$G_G = \frac{W_G}{A_G} \tag{3}$$

$$G_L = \frac{W_L}{A_L} \tag{4}$$

The volume flow is thus:

$$J_G = \frac{Q_G}{A_T} \tag{5}$$

$$J_L = \frac{Q_L}{A_T} \tag{6}$$

The total cross section occupied by the gas and liquid phases:

$$A_T = A_G + A_L \tag{7}$$

The ratio of the flow of the biphasic mixture:

$$x = \frac{G_G}{G_M} = \frac{G_G}{G_G + G_L} = \frac{W_G}{W_M} = \frac{W_G}{W_G + W_L} \tag{8}$$

The two-phase void fraction or gas presence fraction:

$$\alpha = \frac{Q_G}{Q_M} = \frac{Q_G}{Q_G + Q_L} \tag{9}$$

The total mass flow rate is defined as:

$$W_M = W_G + W_L \tag{10}$$

The density of the mixture is:

$$\rho_M = \alpha \cdot \rho_G + (1-\alpha)\rho_L \tag{11}$$

In accordance with figure 3 and using the suffix 1 for the inlet of the junction T and the suffixes 2 and 3 for the outlet branches, the mass balance gives:

$$G_1 A_1 x_1 = G_2 A_2 x_2 + G_3 A_3 x_3 \tag{12}$$

For equal diameters in the test sections (A_1=A_2=A_3) we have:

$$G_1 x_1 = G_2 x_2 + G_3 x_3 \tag{13}$$

For a perfect separation of the gas from the inside of the branch 1 of the T to the deviation in the branch 3, we must have in the branch 2, W_{G2}=0 which gives:

$$\frac{x_3}{x_1} = \frac{1}{G_3 / G_1} \tag{14}$$

This equation shows the relationship between the ratio of the mixture and the ratio of masses of flow in the incoming T and deviating for perfect separation. Alternatively, by taking equal diameters of the test sections, the relationship (15) is obtained and shown in figure 3:

$$\frac{x_3}{x_1} = \frac{1}{W_3 / W_1} \qquad (15)$$

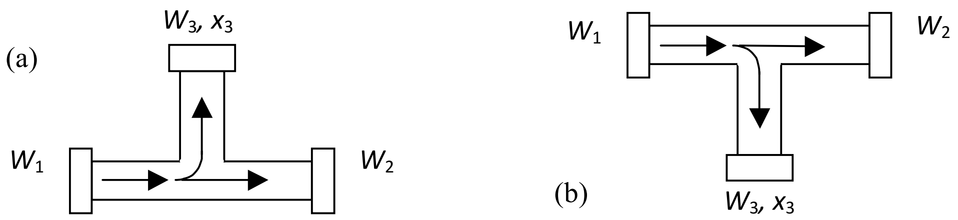


Figure 3 : T-junctions scheme: (a) upward, (b) downward.

Insertion of T-junction in a pipe causes turbulence in the mixture flow, allowing the system to act as a separator which becomes more efficient when the experimental results are close to the so-called complete separation (theoretical) curve as shown in figure 3. Contrary, if the ratio of the mixture is close to unity, the junction T becomes unable to separate significantly the liquid and the gas stream is diverted into the branch of the T-junction.

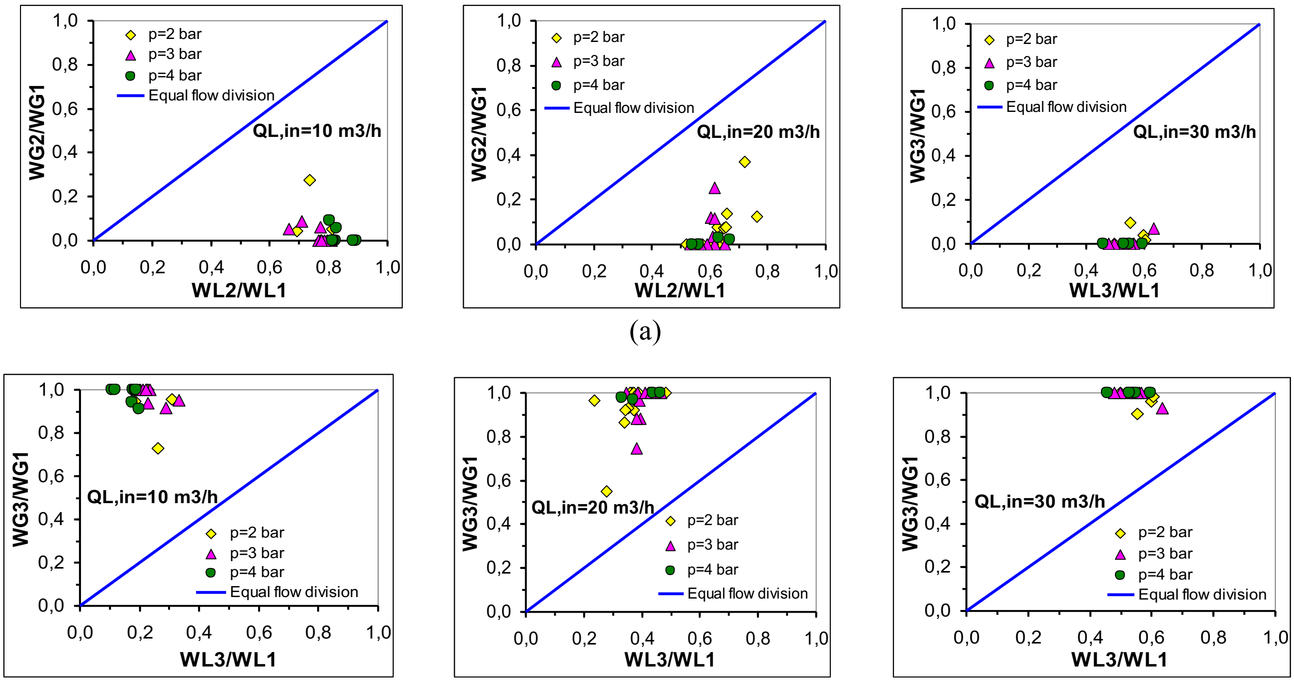
4. Results and discussion

The start-up and examination of the test loop is treated with preliminary analysis of the parameters previously described for a separation of the gas-liquid phases in flowing. During the first tests, the behavior of the simple T junctions was tested for several configurations of the separator. The ascending and descending configuration branches (Fig. 3) are exploited at the inlet water flow rates Q_{Lin} operating at 10, 20 and 30 m^3/h.

The results of the tests will be presented with final observations in the form of organized graphs to compare the performance of the separation in order to facilitate the interpretation and the explanation of each case studied. Tests at different biphasic mixture ratios flowed at the inlet were carried out.

A study of the flow rate of each liquid and gaseous phase as a function of the void fraction (gas) was carried out for liquid supply rates of 10, 20 and 30 m^3/h at pressures of 2, 3 and 4 *bars*.

The "square" diagrams of figure 4 are necessary to examine the dominant separation zones of the gas-liquid flow separated by a diagonal line. This latest is itself the equal separation line of the two phases and the experimental points of each diagram appear on one side of this one according to the phase extraction branch.



(a)

(b)

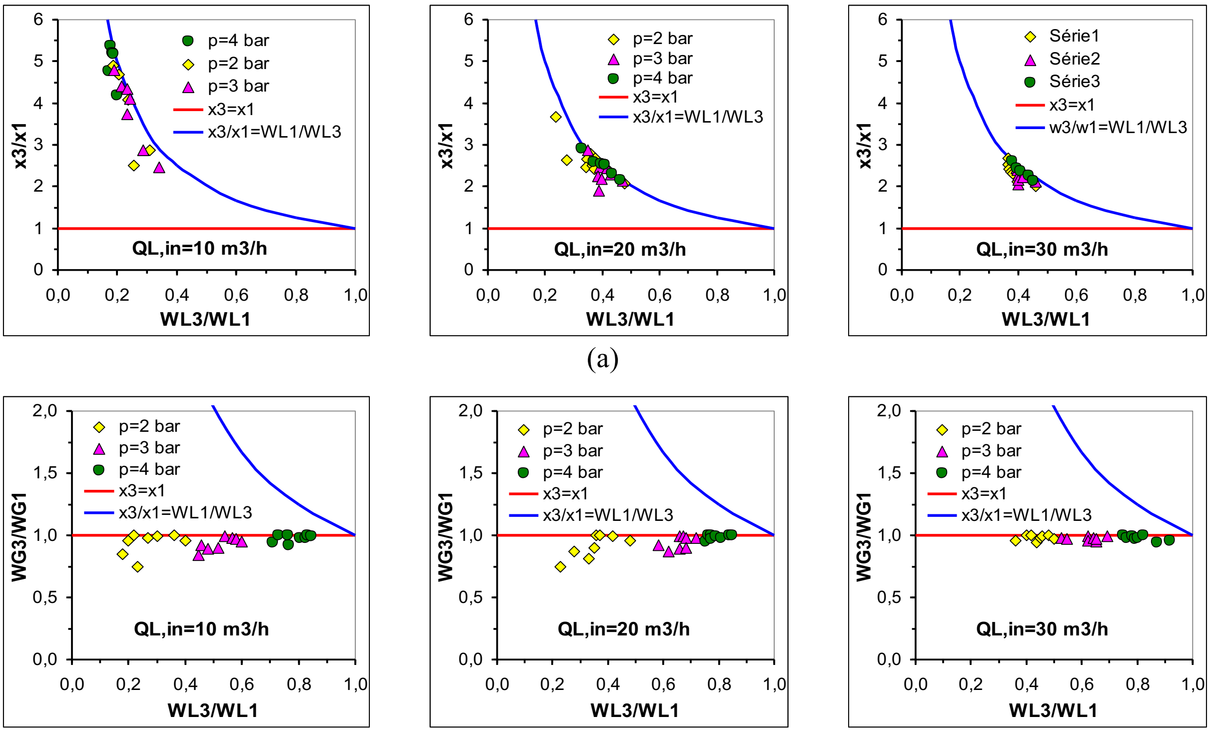
Figure 4 : Effect of the pressure on the phase separation at constant flow rate: (a) mass ratios, gas v. liquid in the branch 2, (b) mass ratios, gas v. liquid in the ascending branch 3.

The axis of ordinates is the line of extraction or non-extraction of the gas and that of the abscissa represents the line of extraction or non-extraction of the liquid. The other two sides of the square give the total separation of liquid or gas.

In diagrams of figure 4 (a) the experimental points are located to the right of the diagonal where the extraction of the liquid in the branch 2 is important at high pressures. It is noted that the increase in flow rate Q_{Lin} decreases the ratio of the masses W_{L2}/W_{L1} in the branch 2, thus reducing the amount of passage of the liquid in the branch. At the same time, the extraction of the gas in the ascending branch 3 indicated by the diagrams of figure 4 (b) is defined by the experimental points to the left of the diagonal, where the ratio of the masses W_{G3}/W_{G1} of passage of the gas in the branch 3, similar to branch 2, is reduced by increasing the flow rate Q_{Lin}.

The separation rates of the gas-liquid flow in the descending T-junction for the liquid in the branch 2 do not appear to be interesting because the ratios of the masses W_{L2}/W_{L1} of the liquid approach the diagonal and, in parallel, gas ratio in the descending branch 3 also has mass ratios W_{G3}/W_{G1} close to the diagonal. The square diagrams of figure 4 make it possible to see clearly the dominant phase in each branch, showing thus the degree of efficient separation. The separation is optimal if the experimental values expressed by the ratio of the mass of each phase in the continuation branch 2 or of the deflection branch 3 move away from the diagonal of the equal separation rate toward the total extraction line of the liquid or gas phase (side of square of unit value).

Figure 5 represent the characteristics of phase separations expressed by the quality ratio x_3/x_1 in the branch 3 with respect to the inlet 1. This ratio, as a function of the ratio of the mass flow rates W_{L3}/W_{L1} at constant flow rate Q_{Lin} and different pressures, allow to clearly qualify the separation of the phases. The abscissa axis (x_3/x_1=0) indicates that there is no gas extraction, the horizontal line (x_3/x_1=l) substitutes the equal separation diagonal in the diagrams of figure 4 . The equation (15) in hyperbola shaped (figures 5) is the total gas extraction line: when x_3=1, the horizontal line $x_3/x_1=1/x_1$ (depending on the inlet quality) cuts hyperbola for $W_3/W_1=x_1$. On this horizontal line, only the gas is extracted.



(a)

(b)

Figure 5 : Phase separation characteristic in branch 3: (a) vertical ascending, (b) vertical descending.

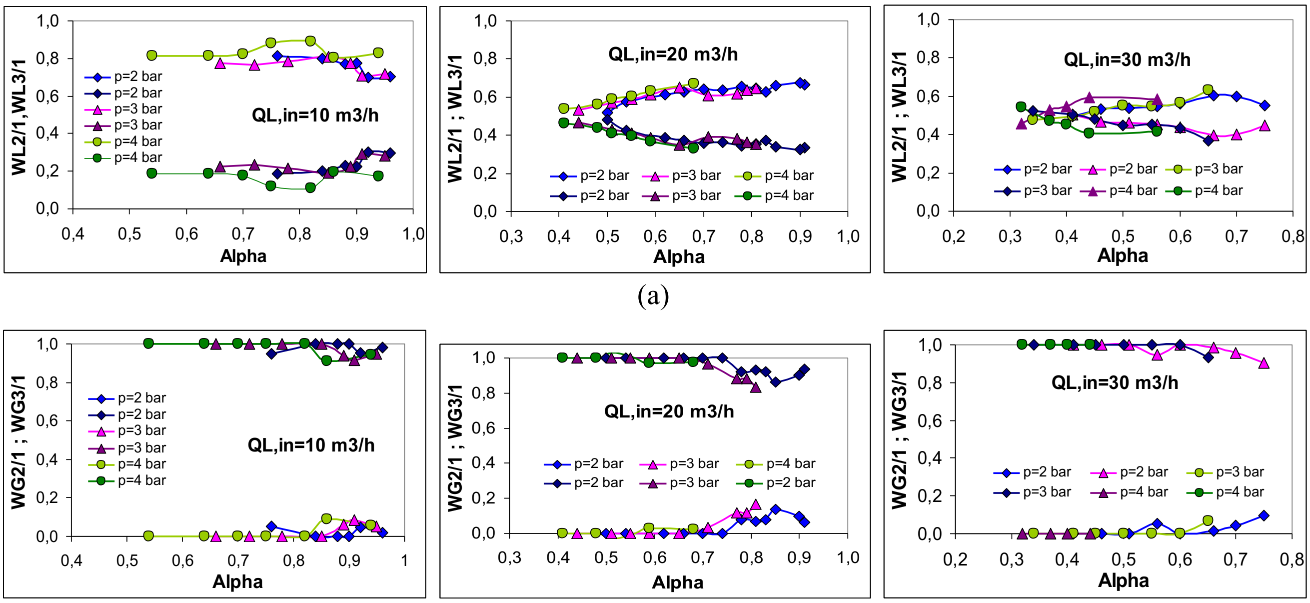
The advantage of this representation "according to the inlet" is the visualization of a minimum or a maximum representing respectively the maximum liquid or the gas separation (since the minimum will appear below and the maximum at the top of the equal separation line $x_3=x_1$). The effective separation of the gaseous phase in the branch 3 for the accumulated values in the vicinity of the ratio W_{G3}/W_{G1}=1 is better for the inlet flow Q_{Lin}=30 m^3/h. The curves of figure 5 reveal experimental values close to the curve of perfect separation with a progression of these values in terms of the quality ratio x_3/x_1 as a function of the pressure at constant flow rate of the inlet liquid. The increase of this flow rate further improves the separation of the phases to the desired optimal values.

In figure 6 is indicated the mass ratios as a function of the void fraction. The graphs of figure 6 (a) provide the ratios of the masses W_{L2}/W_{L1} of liquid and those of figure 6 (b) the ratios of the masses of the gas.

The variation of the ratios of the masses W_{L2}/W_{L1} and W_{G2}/W_{G1} as a function of the void fraction for the two configurations of the vertical branch height of the junctions T is given by figure 7. The study was carried out for "high" and "low" configurations (H=0,7 m et 1,4 m) for flow rates Q_{Lin}=10, 20 et 30 m^3/h at different values of the void fraction.

Figure 6 shows the influence of the increase in the supply pressure for a same flow rate on the void fraction. As the pressure increases, the field of the void fraction widens to reach the same maximum value ranging from 0.76 ÷ 0.96 at 2 *bar* and from 0.66 ÷ 0.95 at 3 *bar* to arrive at 0.54 ÷ 0.94 at 4 *bar*. Under these conditions, for the three pressure values, a separation level of the gaseous phase is observed above 80% in the branch 2 of the ascending T junction and 20% in the branch 3.

The graphs represented by figures 4, 5 and 6 allow qualifying the installation for the separation of the air-water phases in flow in the junctions T at vertical branch of upward or downward deflection 3 and in the horizontal continuation branch 2.

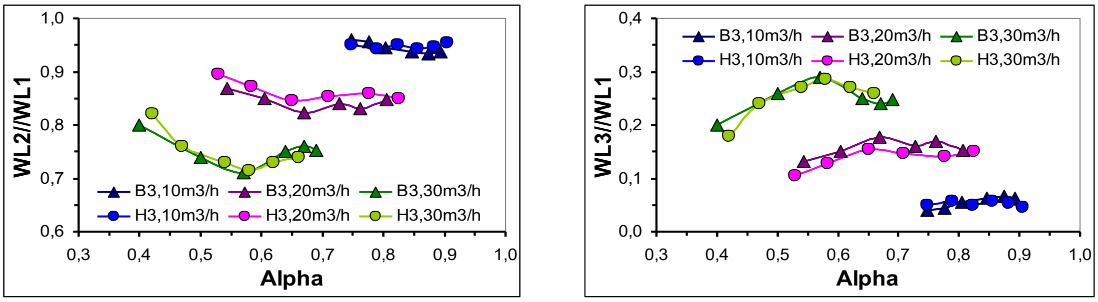


(a)

(b)

Figure 6 : Effect of pressure on the void fraction at constant flow rate in an ascending T: (a) ratio of the mass flow rates of the liquid, (b) ratio of the mass flow rates of the gas.

The increase in the ratios W_{L2}/W_{L1} et de W_{G2}/W_{G1} with a greater number of vertical T junctions can be noted in figure 7 for "high" configurations as well "low" configurations for each value of Q_{Lin} and for different values of α. The height of the vertical pipes H = 0.7 and 1.4 m affects the separation of the two phases. It is noted that for the same flow rate the change interval of the void fraction increases with the increase in the flow pressure, noting that for 2 bar, α varies between 0.76 ÷ 0.96; for 3 bar it varies between 0.66 and 0.95 and for 4 bar between 0.54 ÷ 0.94.



(a)

(b)

Figure 7 : Effect of branch height and inlet flow rate on liquid phase separation (a) ratio of mass flow rate of branch 2, (b) ratio of mass flow rate of branch 3.

Conclusion

This work provides an experimental result of the efficient separation of gas-liquid two phase flow in vertical T junctions. Excellent values have been obtained using the separator which has proved to be very efficient by combining only three vertical branches which constitute a simple construction suitable for most industrial applications and replacing the traditional complicated and costly separators. It is an important and very economical solution that can be adapted to the desired degree of separation. From the set of geometric and operative parameters involved, this experimental investigation made it possible to show the importance of the junctions T, of more or less cumbersome configurations, less effective for the liquid but capable of better performances for gas separation. However, the height *H* of the vertical branch seems to be adapted to the separation of the liquid in a large diapason of inlet flow rate but only for a single configuration of the deviated branch. In accordance with industrial applications and their requirement, it is possible to modify the design of the separator by changing its geometry or by adding advantageous elements in order to obtain a better and efficient separation of the liquid or gaseous phase.

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