Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).
Description

[0001] The present invention concerns a pipe separator or, more specifically, the inlet to such a separator, the pipe separator comprising an extended tubular body with a diameter that is principally the same as or slightly larger than the diameter of the inlet pipe of the separator.

[0002] Applications for patents for pipe separators of the above type were first submitted by the applicant in the present case in 1996. One of these patent applications is the applicant's own international patent application PCT/NO 03/00265, which shows such a separator. Pipe separators are very effective for separation of fluids with non-mixable fluid components and also represent a simple, structurally light solution compared with conventional gravitation separators. In some situations in connection with the separation of fluids, for example an oil, gas and water flow with a high gas content, plug flow may occur, one reason being design-related conditions, which may reduce the separation in the separator. The present invention represents a solution that will completely eliminate such plug flow.

[0003] The present invention is characterised as specified in the attached independent claim 1.

[0004] A pipe separator having the features of the preamble of claim 1 is described in US 1,482,688. Another prior art pipe separator is disclosed in US 1,939,988.

[0005] Dependent claims 2-4 define advantageous optional features of the present invention.

[0006] The present invention will be described in further detail in the following using examples and with reference to the attached drawings, where:

Fig. 1 shows a longitudinal section of part of a separator with an inlet,

Fig. 2 shows a longitudinal section of part of an alternative separator,

Fig. 3 shows an example of a separator in accordance with the present invention.

[0007] Fig. 1 shows, as stated above, part of a pipe separator 1 with an inlet arranged in connection with a supply pipe 3 for a multiphase flow, for example oil, water and gas.

[0008] The flow pattern in a multiphase flow upstream of the pipe separator is often gas/fluid plug flow if the gas/fluid composition and the design of the supply pipe are unfavourable. In the figure, the fluid plugs 4 are shown as darker parts, while the gas takes the form of gas bubbles 5 in a light colour or white.

[0009] The present invention involves “puncturing” the gas bubbles and removing them so that the gas phase is mainly collected in a gas collector and the fluid phase remains in the main pipe. This is achieved by means of a separate gas manifold 2, arranged in connection with the inlet. The manifold 2 comprises a number of vertical degassing pipes 7, which are connected to the transport pipe immediately ahead of the inlet to the separator and which end in a slightly inclined gas collection pipe 6. The gas is thus diverted up through the vertical degassing pipes and collected in the gas collection pipe 6.

[0010] Tests have shown that this an effective way of eliminating plug flow while also ensuring that a constant fluid flow is supplied to the pipe separator.

[0011] The gas that is removed can bypass the pipe separator via the gas collection pipe 6 and be added to the oil phase straight after the separator, or it can be transported onwards to a gas tank or similar. The system can be designed so that the gas removal is driven by the normal pressure drop in the system.

[0012] Fig. 2 shows an example in which the supply pipe 3 with the gas manifold 2 is raised to a level (in the area 9) above the pipe separator 1. By raising the gas manifold above the pipe separator, as has been done here, the gas is forced along the gas path, i.e. up into the gas manifold 2.

[0013] Moreover, as shown in Fig. 3, the diameter of the inlet pipe at the inlet to the separator, under (at 8) the last of the degassing pipes 7 of the manifold, has an extended diameter, for example equivalent to the diameter of the pipe separator. By increasing the pipe diameter in the last part of the gas manifold so that the fluid speed in the pipe is reduced, gas that is not separated can flow back to the last degassing pipe 7.

[0014] The purpose of the design of the gas manifold in accordance with the present invention is to:

1. Separate out the gas phase from a gas/oil/water well flow in a simple manner that does not subject the multiphase flow to high shearing forces. High shearing forces are normally negative for the separation.
2. Ensure the fluid flow has the correct phase in the separator, i.e. water-continuous flow for the water phase and oil-continuous flow for the oil phase. This reduces mixing in the separator inlet and reduces the formation of multiple dispersions in the mixing process in the inlet.

Claims

1. A pipe separator (1) having an inlet device, the pipe separator (1) having an extended tubular body, the inlet device comprising:

an inlet pipe (3), wherein the diameter of the pipe separator (1) is the same as or larger than the diameter of the inlet pipe (3); and
a gas manifold (2) connected to the inlet pipe (3), the manifold (2) comprising a plurality of vertical degassing pipes (7) connected to the inlet pipe (3) immediately ahead of the pipe separator (1), the degassing pipes (7) ending in an over-
lying gas collection pipe (6), wherein the gas manifold (2) is arranged such that, in use, gas is diverted up through the degassing pipes (7) and collected in the gas collection pipe (6) for return to an outlet pipe after the pipe separator (1) or transport to a gas tank or a gas processing plant;

characterised in that the diameter of the inlet pipe (3) below the degassing pipe closest to the pipe separator (1) is larger than the diameter of the inlet pipe (3) below the remaining degassing pipes.

2. A pipe separator (1) as claimed in claim 1, wherein the inlet pipe (3) and the gas manifold (2) are raised to a level above the pipe separator (1).

3. A pipe separator (1) as claimed in claim 1, wherein the diameter of the inlet pipe (3) below the degassing pipe closest to the pipe separator (1) is equal to the diameter of the pipe separator (1).

4. A pipe separator (1) as claimed in any preceding claim, wherein the gas collection pipe (6) is inclined with respect to the inlet pipe (3).

Revendications

1. Séparateur de tuyau (1) ayant un dispositif d’entrée, le séparateur de tuyau (1) ayant un corps tubulaire étendu, le dispositif d’entrée comportant :

   un tuyau d’entrée (3), dans lequel le diamètre du séparateur de tuyau (1) est identique ou supérieur au diamètre du tuyau d’entrée (3) ; et
   un collecteur de gaz (2) raccordé au tuyau d’entrée (3), le collecteur (2) comportant une pluralité de tuyaux de dégazage verticaux (7) raccordés au tuyau d’entrée (3) immédiatement avant le séparateur de tuyau (1), les tuyaux de dégazage (7) se terminant dans un tuyau de collecte de gaz sus-jacent (6), dans lequel le collecteur de gaz (2) est agencé de telle sorte que, en utilisation, le gaz est dévié vers le haut à travers les tuyaux de dégazage (7) et collecté dans le tuyau de collecte de gaz (6) pour un retour vers un tuyau de sortie après le séparateur de tuyau (1) ou

   un transport jusqu’à un réservoir de gaz ou une installation de traitement de gaz ;

   caractérisé en ce que le diamètre du tuyau d’entrée (3) sous le tuyau de dégazage le plus proche du séparateur de tuyau (1) est supérieur au diamètre du tuyau d’entrée (3) sous les tuyaux de dégazage restants.

2. Séparateur de tuyau (1) tel que revendiqué dans la revendication 1, dans lequel le tuyau d’entrée (3) et le collecteur de gaz (2) sont surélévés à un niveau au-dessus du séparateur de tuyau (1).

3. Séparateur de tuyau (1) tel que revendiqué dans la revendication 1, dans lequel le diamètre du tuyau d’entrée (3) sous le tuyau de dégazage le plus proche du séparateur de tuyau (1) est égal au diamètre du séparateur de tuyau (1) ;

4. Séparateur de tuyau (1) tel que revendiqué dans l’une quelconque des revendications précédentes,
dans lequel le tuyau de collecte de gaz (6) est incliné par rapport au tuyau d’entrée (3).
REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 0300265 W [0002]
- US 1482688 A [0004]
- US 1939988 A [0004]