

Title (en)
Cryogenic process for separating air gases

Title (de)
Kryogenisches Luftzerlegungsverfahren

Title (fr)
Procédé de séparation cryogénique des gaz de l'air

Publication
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Application
EP 99403101 A 19991209

Priority
FR 9816243 A 19981222

Abstract (en)

Cryogenic separation of the components in air comprises distillation using a system of columns comprising two turbines (7, 9) in which the feed pressure to the first turbine is not lower than the feed pressure to the second turbine. For the cryogenic separation of the components in air gas by distillation, a system of columns has at least one column (11, 13, 90) where all the air is compressed (1). Part of the air is compressed to an intermediate pressure (5) and a fraction of this air is compressed to a high pressure (6). The air at a high pressure is divided into at least two fractions (23, 25) for delivery to two turbines (7, 9). The coolant of the hot turbine (7) is recycled at least partially towards the hot end of the exchanger (8) at a higher pressure. A liquid for the air separation apparatus vaporizes in the exchanger. The feed pressure to the first turbine is not lower than the feed pressure to the second turbine. Preferred Features: The feed pressures to the two turbines are identical or the first turbine takes a higher pressure, possibly at least 1 bar higher than the feed to the second turbine. The first column (11) is part of a double or a triple column structure. The first column operates at a higher or lower pressure than the second, in a double column, to give a yield enriched with oxygen and a yield enriched with nitrogen to be passed to the second column (13). A liquid yield from the first column, passed into the second, is vaporized by heat exchange with the air, possibly after it has been pressurized. All the air can be compressed to the intermediate pressure level. The air is cleaned in water and carbon dioxide at the intermediate pressure. The suction intake temperature at the first turbine (7) is higher than the temperature level at the second turbine (9). The unrelaxed portion (29) of the first and/or second fraction is condensed by heat exchange with a liquid drawn from the column (13) which vaporizes. The liquid drawn from the columns (11, 13, 90) is enriched with oxygen, nitrogen or argon, to vaporize by heat exchange with the air. An initial liquid vaporizes by exchange with the unrelaxed portion of the first fraction which condenses, and a second liquid vaporizes by exchange with a relaxed or unrelaxed portion of the second fraction, which condenses. An air fraction or part of the second fraction is chilled in a refrigerator group. The outlet temperature of the refrigerator group is the entry temperature into the second turbine. The energy generated by at least one turbine (7, 9) is used to drive one or more compressors (5, 6). One compressor, powered by a turbine, increases the pressure of the high pressure fraction before the first fraction is cooled. The energy generated by the turbines drives the compressors in series, to compress the first fraction. The first fraction condenses at least partially during expansion in the first turbine. The outlet temperature at the second turbine is close to the entry temperature at the first turbine. The yield from the low pressure column feeds an argon column (90). An Independent claim is included for an assembly with three columns, where one operates at high pressure, one at an intermediate pressure and a low pressure column, together with a system to draw liquid from them.

Abstract (fr)

Dans un appareil de séparation d'air par distillation cryogénique, tout l'air est comprimé à une moyenne pression (1). Ensuite une partie de l'air est comprimé à une pression intermédiaire (5) et une fraction de cet air est comprimée à une haute pression (6). L'air à haute pression est divisé au moins en deux (23,25) et détendu dans deux turbines (7, 9), le refroidissement de la turbine chaude (7) étant recyclé au moins partiellement vers le bout chaud de l'échangeur (8) à une pression supérieure. Un liquide provenant de l'appareil de séparation d'air se vaporise dans l'échangeur.
<IMAGE>

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