

**CLAIMS**

1. Method for controlling a compressor comprising at least a last stage (40; 60) and a compressor load controller (90), a first set point outlet pressure, corresponding to a consumer needed pressure, being given in the compressor load controller (90), characterised in that it comprises the steps of:
- a- measuring the temperature at the inlet of the last stage (40; 60),
  - b- measuring the ratio between the outlet pressure (Pout) and the inlet pressure (Pin) of the last stage (40; 60) of the compressor,
  - c- computing a coefficient ( $\Psi$ ) based at least on the value of the inlet temperature (Tin) and on the measured pressure ratio (Pout/Pin),
  - d- if the computed coefficient ( $\Psi$ ) is in a predetermined range, changing the first set point outlet pressure by a second set point outlet pressure greater than the first set point outlet pressure until the coefficient ( $\Psi$ ) computed with the second set point outlet pressure goes out of the predetermined range, and
  - e- adapting the pressure of the fluid coming out of the compressor in a pressure regulator (100) to the first set point outlet pressure corresponding to the consumer needed pressure.
2. Method according to claim 1, characterised in that the coefficient ( $\Psi$ ) computed in step c is a coefficient calculated by multiplying the inlet temperature (Tin) of the compressor by a logarithm of the ratio of the outlet pressure by the inlet pressure (Pout/Pin).
3. Method according to claim 2, characterised in that the coefficient calculated in step c is a head coefficient:
- $$\Psi = 2 * \Delta h / U^2$$
- where:
- $\Delta h$  is the isentropic enthalpy rise in the last stage,
- U is the impeller blade tip speed,
- and in that
- $$\Delta h = R * T_{in} * \ln (P_{out}/P_{in}) / MW$$
- where:
- R is a constant,
- Tin is the temperature of the gas at the inlet of the last stage (40; 60),
- Pout is the pressure at the outlet of the last stage (40; 60),

$P_{in}$  is the pressure at the inlet of the last stage (40; 60), and

MW is the molecular weight of the gas going through the compressor.

4. Method according to claim 1 to 3, characterised in that in step d, if the computed coefficient ( $\Psi$ ) is less than a predetermined value, the second set point outlet pressure is so that the coefficient ( $\Psi$ ) computed with this second set point outlet pressure equals the predetermined value.

5. Method according to one of claims 1 to 4, characterised in that the compressor is a plural stage compressor, in that at least one stage (10) of the compressor comprises a variable diffuser valve (92) and in that the compressor load controller (90) adjusts the discharge pressure of the compressor by acting on at least one variable diffuser valve (92).

6. Gas supplying system with a compressor comprising:

- at least one compressor stage, so called last stage (40; 60),
  - a compressor load controller (90),
  - a temperature sensor (78) for measuring the temperature ( $T_{in}$ ) at the inlet of the last stage (10),
  - a first pressure sensor (81) for measuring the pressure ( $P_{in}$ ) at the inlet of the last stage (40; 60),
- characterised in that the system further comprises:
- a pressure regulator (100) downstream from the last stage, and
  - means (88, 90) for implementing a method according to one of claims 1 to 5.

7. Gas supplying system according to claim 6, characterised in that at least a compressor stage (10) comprises a variable diffuser valve (92).

8. Gas supplying system according to claim 6 or 7, characterised in that the compressor is a plural stage centrifugal compressor.

9. Gas supplying system according to claim 8, characterised in that the compressor is a four stage compressor.

10. Gas supplying system according to claim 8, characterised in that the compressor is a six stage compressor.

11. Gas supplying system according to one of claims 8 to 10, characterised in that each stage comprises an impeller.

12. Gas supplying system according to claim 11, characterised in that

all said impellers are mechanically connected.