CHEMOPETROL, a.s. TECHNICAL SERVICES	**Recommended flow rates** **of technical gases through the pipeline.**	**N 13 010**

The standard is binding on all company departments and external organizations that determine the flow rates of gaseous oxygen, air, nitrogen, hydrogen and synthesis gas. It does not apply to the Litvínov and Kralupy refinery unit.

The units are obliged to acquaint with the standard all external companies that conduct these activities for them and for which the standard is also binding.

C o n t e n t :

1. General stipulations

1.1 **Scope of validity**

This standard applies to the determination of the recommended flow rates of gaseous oxygen, air, nitrogen, hydrogen and synthesis gas.

1.2 The standard also recommends the velocities of these gases when designing new pipeline systems and for the construction of new production units.

1.3 The standard is issued in order to:

1.3.1 Familiarise technical professional staff of the joint-stock company with the issue of flow rates, especially in the case of hazardous and polluted technical gases.

1.3.2 Prevent economic damage resulting from exceeding practically acceptable mean flow rates (the total flow resistance automatically increases with increasing flow velocity of the working substance).

1.3.3 Increase the durability and operational safety of fittings, pipeline and its parts (elbows, T-pieces, transition pieces, etc.) resulting from the reduction of erosive effects caused by:

a) by erosion (during long-lasting impacts of released corrosion products, the wall thickness in the knees and other shaped pieces is mechanically damaged at high speeds of the work substance).

b) lashing the walls when changing the direction of passage of the work substance by mechanical impurities contained directly in technical gases.

1.4 Causes of erosion and corrosion.

1.4.1 Abnormal wear (lashing), corrosion of pipeline and its parts (elbows, T pieces, transition pieces, etc.) are influenced by the following factors:

a) concentration and composition of aggressive environment,

b) flow rate, specific gravity and humidity of the work substance,

c) formation of acidic environment and solids content depending on the speed of movement of the transported medium,

d) working overpressure and working temperature (presence of oxidant at high temperatures causes chemical corrosion),

e) pipeline diameter ; with increasing pipe diameter the flow rate of the work substance decreases in proportion to its flow quantity. A small diameter has a relatively smaller wall thickness, so for smaller pipe diameters the loss of wall thickness due to corrosion and erosion is relatively greater than that in large diameters.

f) unstable working conditions during production ; frequent change of medium, flow rate of the work substance and pressure at simultaneous change of working temperature causes faster corrosion than it is at stable technology of production process. An example of dependence of corrosion on increased pressure at simultaneous change of working temperature is gaseous hydrogen which does not cause corrosion of ferrous alloys under normal pressures and temperatures, but is very aggressive at pressures above 30 MPa and at temperatures from 200 to 300°C and above.

1.5 Pipeline selection instructions.

1.5.1 When selecting the pipeline, it is necessary to take into account the prescribed pressure losses, or to select the pipeline diameter from technical - economic indicators. It is recommended to observe the guide gas velocities according to Table 1, especially in the case of polluted gases containing corrosive components.

2. Recommended gas flow rates

2.1 The flow rates of technical gases depending on the working overpressure are recommended to be selected according to Table 1.

2.2 The guide rates according to Table 1 apply to media temperatures of 15°C.

Table 1

Technical gas title	Operation overpressure in MPa	Guide values of the highest suitable rates in m/s
Oxygen	up to 0.1	20
	0,1 - 0,3	15
	0,3 - 0,6	12
	0,6 - 1,6	10
	1,6 - 3,0	6
	3,0 - 10	4
	10 - 20	3
* Air compressor suction pipeline piston centrifugal		 10 - 20 18 - 23
* Air compressor discharge pipeline piston centrifugal	up to 0.6	 20 - 30 25 - 30
* Air	up to 0.6	20
(other pipelines)	0,6 - 1	15
	1 -2	10
	2 - 3	8
	3 - 10	6
	10 - 20	3,5
* * Pure nitrogen	32,5	4 - 11
* * Pure hydrogen	32,5	11 - 20
Nitrogen containing solid and liquid particles	32,5	4 -6
Hydrogen and synthesis gas N_2 + H_2 containing solid and liquid particles	32,5	4 - 8
Synthesis gas, pure	32,5	8 - 15

* Values taken over – Engineering Tables – Ing. J. Bartoš et al. of 1966.

* * Pure gas is a gas free of any mechanical impurities (dust, corrosive products, water droplets, etc.).

3. Recommended technical and organizational measures

3.1 Real rate inspection.

3.1.1 For existing pipeline systems it is necessary to check backwards by calculating whether the actual flow rates of technical gases correspond to the recommended rates in Table 1.

3.2 Periodic inspection of pipeline systems.

3.2.1 In case of disproportionately higher rates compared to the values given in Table 1, it is necessary to take into account the erosive and corrosive effects of the transported gas (solid or liquid particles) and to introduce immediately a regular check on individual sections of the pipeline system according to a predetermined inspection cycle.

3.3 Inspection of separation of working temperature and acidity of condensate.

3.3.1 All existing sections of pipeline system sections and plants must be subjected to a thorough check of separation in terms of the suitability of the structure and its design.

3.3.2 In the case of wet gases, a reliable check of the working temperature and the acidity of the condensate must be introduced.

3.4 Avoidance of condensation of wet gases.

3.4.1 Condensation of wet gases in the pipeline is recommended to be avoided by suitable insulation or by heating in certain sections.

3.4.2 Measures must be dealt with separately in each plant, taking into account the work substance flowing through and the nature of the relevant pipeline system.

3.5 Reduction of soluble gas components.

3.5.1 The content of gas components that are soluble (CO_2, H_2S, etc.) in the moisture of the transported gas is recommended to be reduced to the lowest possible percentage in condensates in case of moisture precipitation.

3.6 Exceeding recommended gas rates.

3.6.1 In case of serious reasons, if the recommended gas rates must be exceeded, inspection cycles shall be provided according to the degree of effect on the pipeline.

Note:
The standard was developed according to available technical sources, engineering tables – Ing. J. Bartoš, 1966, practical experience in Chemopetrol, a.s. and the German Leuna Werke factory.

Changes from the previous edition:
This is a transcription of the standard dated 22 December 1997. The new edition of the standard reflected only changes in technical and organizational character based on organizational changes in the joint-stock company.