In 1906, a method was proposed for fixing atmospheric nitrogen in an electric arc flame. The method did not require the use of artificial raw materials and the complex design of the process, but was distinguished by a large consumption of electricity, which was not profitable from an economic point of view. The arc method of nitrogen bonding over time has been completely superseded by the contact oxidation of synthetic ammonia.

Thus, in a relatively short period of time, two methods for producing nitric acid were developed:

- the arc method of direct oxidation of atmospheric nitrogen to nitric oxide and further processing into nitric acid;
- a method of contact oxidation of ammonia, in which nitrogen is first bound to hydrogen, and then the resulting ammonia is sequentially oxidized to nitric oxide and nitrogen dioxide and absorbed by water to form nitric acid.

Currently, a method for producing nitric acid by the electric arc method is being studied in detail. It is likely that in the future, due to widespread electrification, the temporarily forgotten method of producing nitric acid in electric furnaces of a special design will be used (1907-1909 *A.I. Gorbov* and *V.F. Mitkevich*).

The raw materials for the nitric acid production are ammonia, air and water. Synthetic ammonia is more or less contaminated with impurities. Such impurities are catalyst dust, lubricating oil (when compressed by a piston compressor). To obtain pure gaseous ammonia, evaporation stations and distillation compartments of liquid ammonia are used.

Atmospheric air used in the production of nitric acid is taken in or near the plant. This air is contaminated with gaseous impurities and dust. Therefore, it is thoroughly cleaned to prevent poisoning of the ammonia oxidation catalyst. Air purification is carried out, as a rule, in a scrubber, and then in a two-stage filter.

Water used for technological needs is subjected to special preparation: sediment from mechanical impurities, filtration and chemical purification from salts dissolved in it. Pure steam condensate is required to produce reactive nitric acid.

There are production of dilute and concentrated nitric acid. Dilute acid is mainly used for the production of nitrogen-containing mineral fertilizers. Concentrated nitric acid is used for the manufacture of explosives, dyes, plastics, nitrovarnishes, films, and other important products. Nitric acid is produced from ammonia.

The process for the production of dilute nitric acid consists of three stages:

1) the conversion of ammonia in order to obtain nitric oxide:

$$4NH_3+5O_2 \rightarrow 4NO+6H_2O+Q;$$

2) the oxidation of nitric oxide to nitrogen dioxide:

$$2NO+O_2 \rightarrow 2NO_2+Q;$$

3) absorption of nitrogen oxides by water:

$$4NO_2+O_2+2H_2O \rightarrow 4HNO_3+Q.$$

The total reaction of nitric acid formation is expressed by the equation:

$$NH_3+2O_2 \rightarrow HNO_3+H_2O$$

The process catalysts

It is characteristic that the vast majority of metals and their compounds are active in the ammonia oxidation reaction, but very few of them provide a high *NO* yield (above 90%). So in 1902 by *W. Ostwald* has been shown the superiority of platinum on the activity and selectivity over all other types of catalysts. With high activity and selectivity, platinum has a low ignition