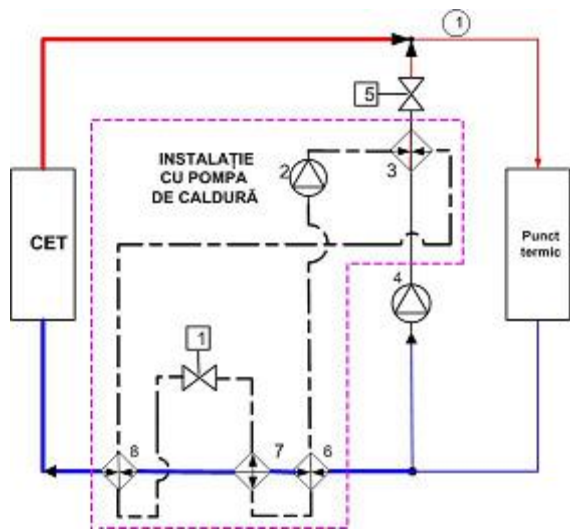


## HEAT PUMP USING CARBON DIOXIDE AS WORKING FLUID FOR WINEMAKING

### Description



Energy intensity decrease of the food industry production is now the purpose of innovative development in this area. Application of heat pumps (HP) in the industry makes up a very small part from the total heat pumps amount. So, for example, heat pumps using low grade heat from technological processes in winemaking practically are not applied, though examples of heating of a part of a factory premises from ground source heat pumps (USA). We offer the scheme of HP and its use in winemaking where HP is used simultaneously at cooling of fermenters, at criomaceraon and at the thermomaceraon, processing of wines by heat and at the sanitary processing, later the same heat pump is used in technological process of wine processing by a cold and simultaneously at hot water preparation (sanitary processing of the equipment, hot water for personnel needs).

This heat pump is used at work of distiller after the end of the period of wine processing by cold, or in the absence of a distiller for the bleeding of heat from the boiler flue gases (serving for the preparation of steam and hot water for the technological process needs) with the purpose of fuel utilization factor increase of the boiler. Expander use is possible, in the last case, in a heat pump loop what raises its energy and economic efficiency. Heat pump station should be supplied with the replaceable gas coolers and evaporators, and also to have a second loop (intermediate heat carrier contour). A cycle of the heat pump with the expander and ejector and HP work conditions at variable heat load assuming the use of linear control laws, and also an adjustable electric drive of the compressor. The use of ejectors for heat pumps on carbon dioxide is described in different works. But common use of expander and ejector was not considered in heat pump till now.

### Innovative Aspect and Main Advantages

Control of transferred thermal capacity from the low potential heat source is realized by means of changing the speed of circulation of a liquid in the loop and changing the area of a heat-transmitting surface, both in the evaporator, and in the intermediate heat exchanger depending on the operating parameter, for example, intensity of fermentation. It is elaborated heat pump with two evaporators which work at the different temperature levels and by the various thermal loads and control system such a heat pump station. Payback period of the proposed heat pump is about 2 years at the price of natural gas 300\$ for 1000 m<sup>3</sup>, at the price of electricity 0,12\$ for 1 kW hour, and at the price of the heat energy 70\$ for 1 Gkal.

### Stage of Development

Draft proposal is elaborated. The elaboration uses elements protected by the patent of Republic of Moldova, N3918