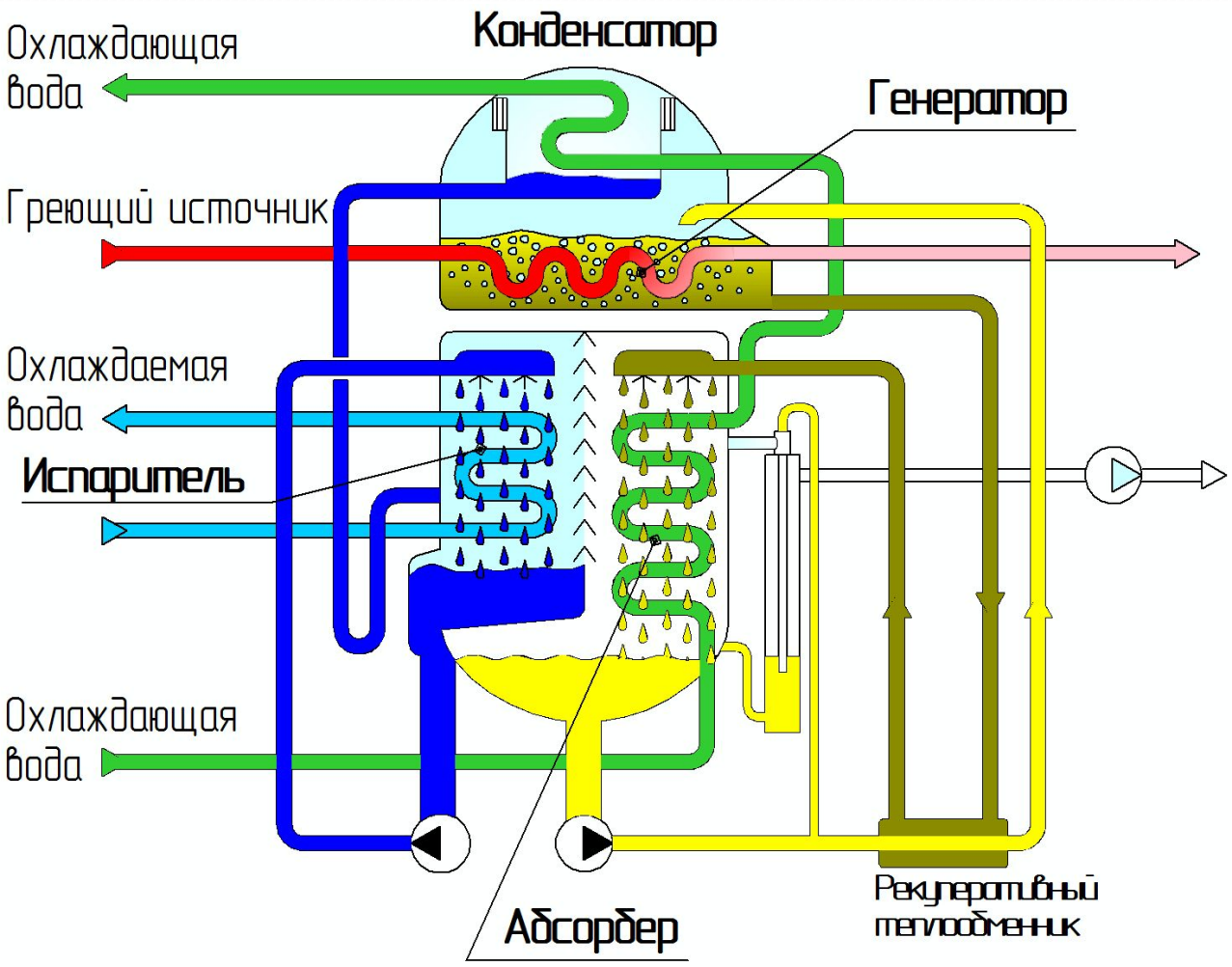
Absorption heat pumps and refrigerating machines

Introduction

Absorption bromistolitievye thermotransformers (ABTT) - heat-using energy-saving equipment:

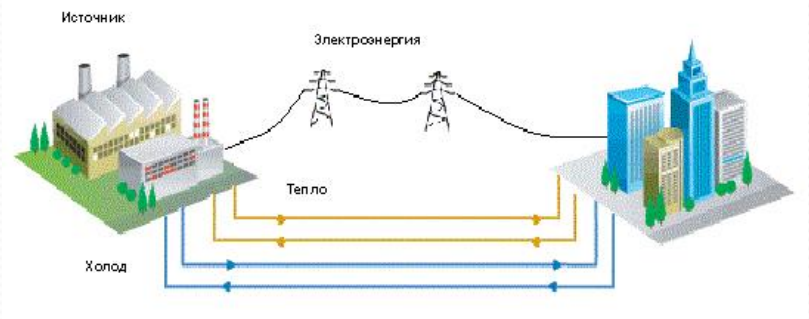
- Refrigeration machines (ABCM) to generate artificial cold and;
- Heat pumps (ABT) for utilization of low-grade heat by transforming it to a level suitable for direct use.
- ABTT are widespread all over the world due to high consumer properties: fire and explosion safety;
- long service life (up to 25 years);
- ecological cleanness;
- low noise;
- no dynamic loads on the Foundation;
- low power consumption;
- et al.

The principle of operation of АВНМ (АВТ)



The scope of ABHM

- *Nonferrous metallurgy;*
- *Petrochemistry;*
- *Food production;*
- *Trigeneration systems;*
- *Conditioning system;*
- *Hothouse economy.*



Compression refrigerating machines (CHM)

Absorption lithium bromide refrigerating machine(ABHM)

The scope of ABTN

- *Heating system;*
- *Hot water system;*
- *Simultaneous heating and cooling in industry and heat power engineering.*

AKOR Direkt – the only one in Russia developer lithium bromide absorption thermotransformers.

- The company performs almost the entire cycle of development and implementation works:
- development of ABTT design schemes and optimal solutions for their application;
- development of design documentation;
- organization of production on the basis of Russian machine-building enterprises;
- start-up and adjustment works;
- training of customer's personnel;
- warranty and service, ABT

In AKOR Direkt developed thirty modifications of ABTT.

ABHM:

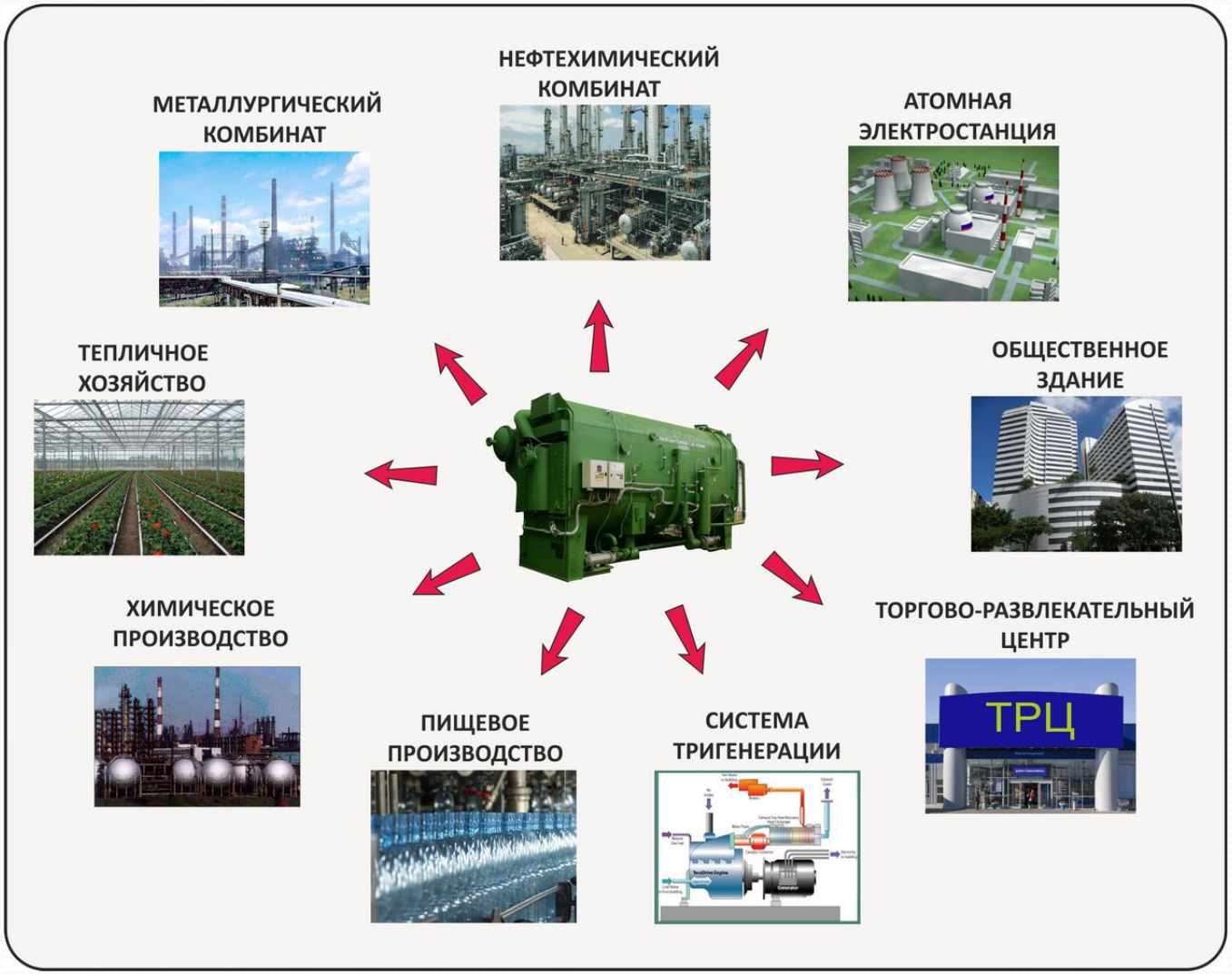
- with water and steam heating with single-stage (ABCM-B, ABCM-P) and two-stage (ABHM2-P) regeneration of the solution with cooling capacity from 600 to 4000 kW;
- with low-temperature water heating with single-stage solution regeneration (ABCM-HN) power from 600 to 4000 kW;
- with fire heating (ABHM-T,TS) capacity from 600 to 3000 kW;

ABT:

- with steam heating (ABTN-P) capacity for heat recovery from 600 to 4000 kW;
- with fire heating (ABT-T) capacity for heat recovery from 600 to 3000 kW.

Since 2001, constructed and commissioned 25 ABHM and 2 ABTN.

The use of ABT AKOR Direktb Russia



Current applications of ABCM in the energy and gas industry

- cooling of the blast air at the entrance to the GTU of power and gas pumping stations in the summer allows to increase the efficiency of the stations.
- gas cooling and condensation in natural gas liquefaction technologies.

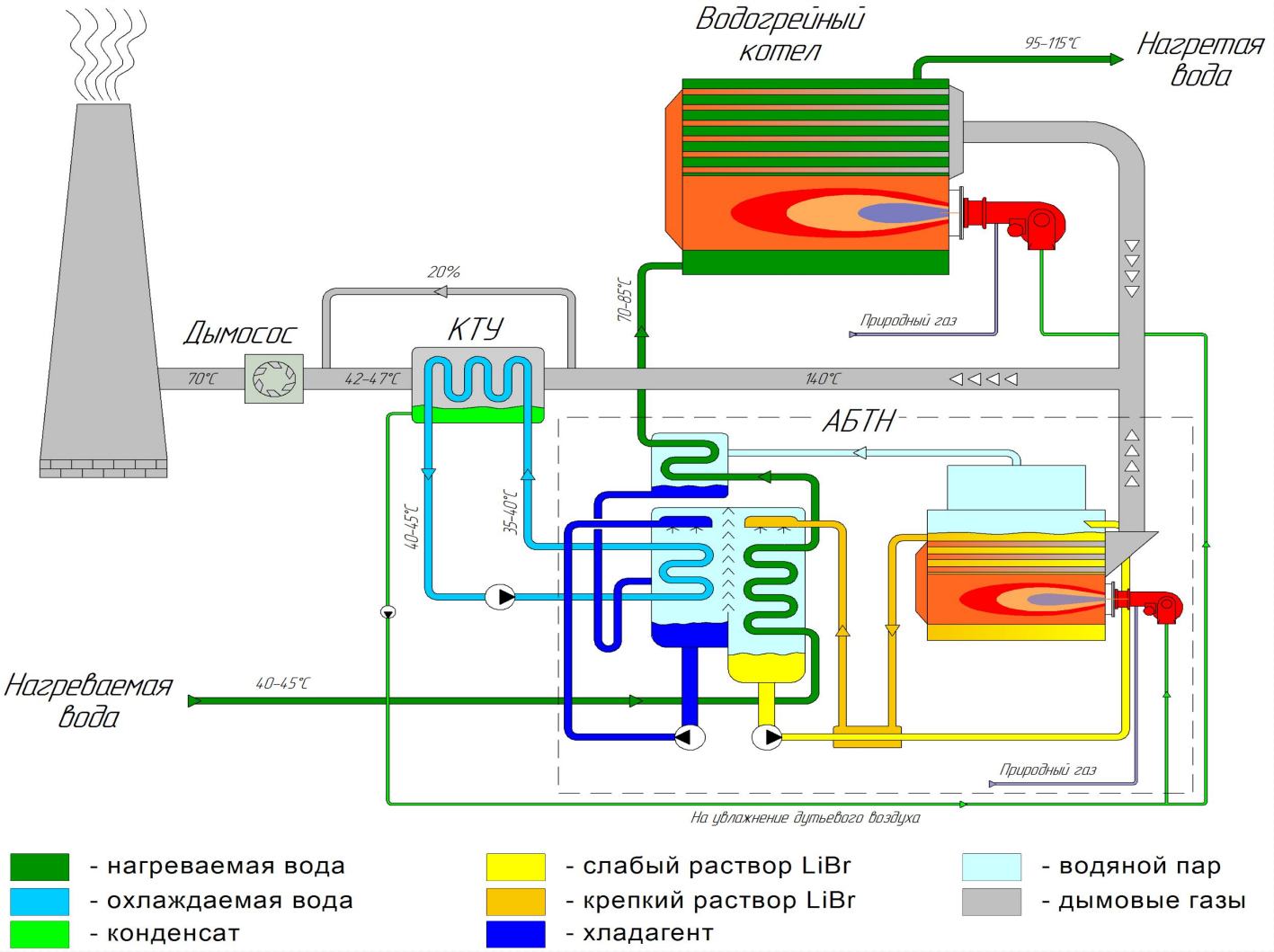
URGENCY

Natural gas combustion in boilers produces up to 19-20% of water vapor by volume (12-13% by weight). In the vast majority of Russian boilers the heat of condensation of water vapor is not used and steam together with flue gases is emitted into the atmosphere.

The cost of gas fuel for heat supply in Russia is 280-300 million tons.t./year (more than 2 tons.t. per person / year). Saving of gas fuel consumption by only 10% will be about 28-30 million tons.t. natural gas (24-26 billion Nm3 per year). The cost of the saved gas will be (at the cost of 1000 Nm3 in 5000 rubles) about 125 billion rubles per year.

The solution to the problem of gas saving for Russian boilers is the creation of systems for deep heat recovery of flue gases on the basis of the condensing heat exchanger of the heat exchanger (KTU) and ABTN. Deep heat recovery refers to the cooling of flue gases below the dew point temperature when water vapor condenses from the waste products of combustion.

Scheme of deep heat recovery of flue gases



INNOVATIVE DEVELOPMENT

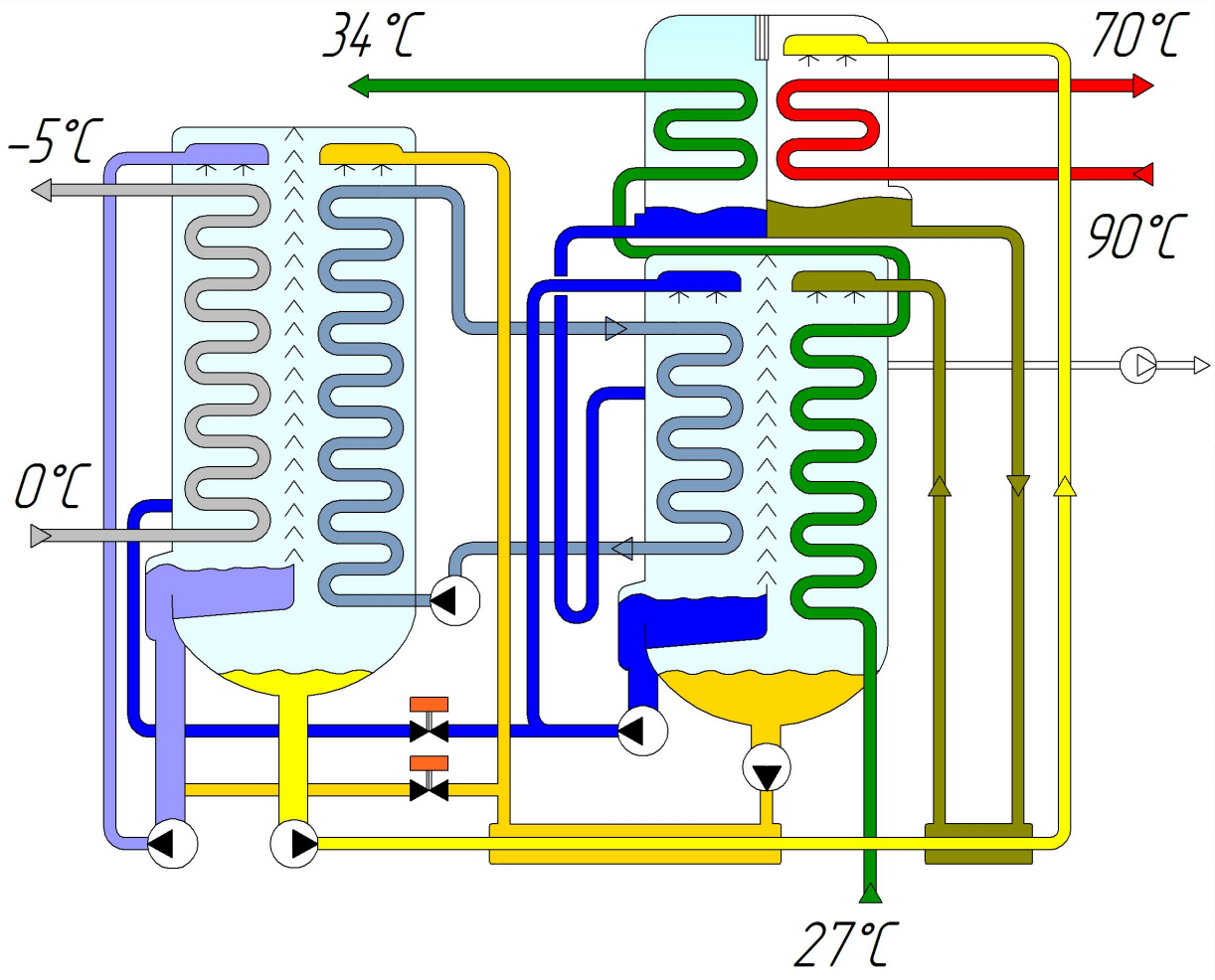
Development of ABCM for the production of cold in the negative temperature range

The scope of ABCM-getting cold positive temperatures (from +3 °C and above). This is due to the fact that water is used as a refrigerant in ABCM, and it is impossible to obtain lower temperatures because of the danger of its freezing. However, in many industrial applications there is a need for lower cooling temperatures, including negative ones:

- obtaining the so-called "ice-cold" water to cool milk;
- cooling of the storage space with the food;
- plastic production technology: cooling of recycled water for extruders, cooling of molds and dies; et al.

The creation of heat-using low-temperature ABCM with negative boiling points of the refrigerant will reduce the consumption of electricity for the production of cold by "freon" cooling technology, practically no alternative at the present time.

ABCM SCHEME WITH TWO-STAGE ABSORPTION



INNOVATIVE DEVELOPMENT

Development of ABTT on an alternative working body.

Around the world, the main absorbent of ABTT is an aqueous solution of lithium bromide (LiBr). However, it is not produced in Russia. The average cost of LiBr solution supplied by foreign manufacturers is 1000 rubles/kg.

An aqueous solution based on LiCl salt is considered as an alternative absorbent in ABT.

LiCl has a number of advantages over LiBr:

- salt is produced in Russia (OAO nzkhk, Novosibirsk, Russia);
- the cost is less than almost 2 times;
- significantly less corrosion activity.

Creation of ABTT on a new absorbent opens prospects of full import substitution of this type of equipment in Russia.

Thank you for your attention!

Two refrigeration machine АВНМ-1500Тс total capacity of 3000 kW (natural gas)

ООО "Karachinsky source", n. Karachi, NSO, 2010

Purpose: cooling of mineral water.

Refrigerating machine АВНМ-3000П capacity of 3000 kW

FKP "Anoit", Kuibyshev, NSO, 2008

Purpose: process water cooling .

Refrigerating machine ABHM-1000vn with capacity of 960 kW
OOO "Basket-6", Lipetsk, 2012
Purpose: for air-conditioning of sausage.

Refrigerating machine ABHM-2000П power of 2100 kW
CoAO "nitrogen", Kemerovo, 2012
Purpose: for cooling water and other media in technological cooling systems of caprolactam production.

Heat pump installation with a heat capacity of 4700 kW on the basis of two absorption brominated heat pumps with fire heating ABTN-600T.
The SEL "khozprominvest", Krasnodar region, 2005
Purpose of the installation:
obtaining hot water for heating and hot water supply of the greenhouse plant using geothermal water.

The first project implemented in Russia is the use of absorption heat pumps.