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***LOW CHARGE AMMONIA CHILLER FOR THE
AIR-CONDITIONING SYSTEM OF THE OJSC
"MYASOMOLMONTAZH" BUILDING,
MINSK, BELARUS***

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Project «Initial Implementation of Accelerated HCFC Phase Out in the CEIT Region»

HCFCs are controlled by the Montreal Protocol on Substances that Deplete the Ozone Layer (Montreal Protocol, MP).

The developed countries of the world supported the decision **to reduce** and ban the production and use of ozone-depleting **HCFCs by 75% by 2010, by 90% by 2015 and by a complete ban - by 2020.**

The *principal global environmental benefit* from the project is the phase-out of HCFCs import and consumption in Belarus to assist the country to gradually reduce dependence on HCFCs and implement its obligations with respect of the Montreal Protocol.

UNDP is supporting the implementation of the hydrochlorofluorocarbons phase-out management plan in cooperation with the Government of Belarus.

Safe Use of HCFC Alternatives in refrigeration and Air-Conditioning

As the phase out of hydrochlorofluorocarbons (HCFCs) progresses, it is expected that there will be a considerably higher uptake, in particular in developing countries of ‘alternative refrigerants’, such as hydrocarbons, ammonia, carbon dioxide, unsaturated hydrofluorocarbons (HFCs) –or HFOs.

Many of these alternative refrigerants have particular characteristics in terms of toxicity, flammability and high pressure which are different from those used previously such as chlorofluorocarbons (CFCs) and HCFCs.

It is therefore important that the refrigeration and air-conditioning industry adapts to both the technical and safety issues concerning these refrigerants.

An important stage for the introduction and distribution of these refrigerants is the implementation of demonstration projects.

The project helps Belarus fulfill its obligations under the Montreal Protocol and help spread natural refrigerants.

- Development of the legal framework for the regulation of imports and consumption of HCFCs
- Strengthening capacity of Customs and enforcement officials, and refrigeration technicians
- HCFC Phase-out in manufacturing sector
- Upgrade of HCFC re-use system
- **Demonstration of benefits of the replacement of refrigeration equipment using alternative technologies with low GWP**
- Raising public awareness of the Strategy of HCFC Phase-Out, the Montreal Protocol, and measures to protect the ozone layer

- **Location : Belarus**
- **Contractor : CJSC "HOLODON", JV "RefUnits"**
- **Assisted funding by UNDP**
- **Technology : Low charge ammonia chiller**
- **Installed: Three-storey office building with 45 offices**
- **Installation cost: 150k \$**
- **Start of development : Oct 2015**
- **Commisioned: June 2017**

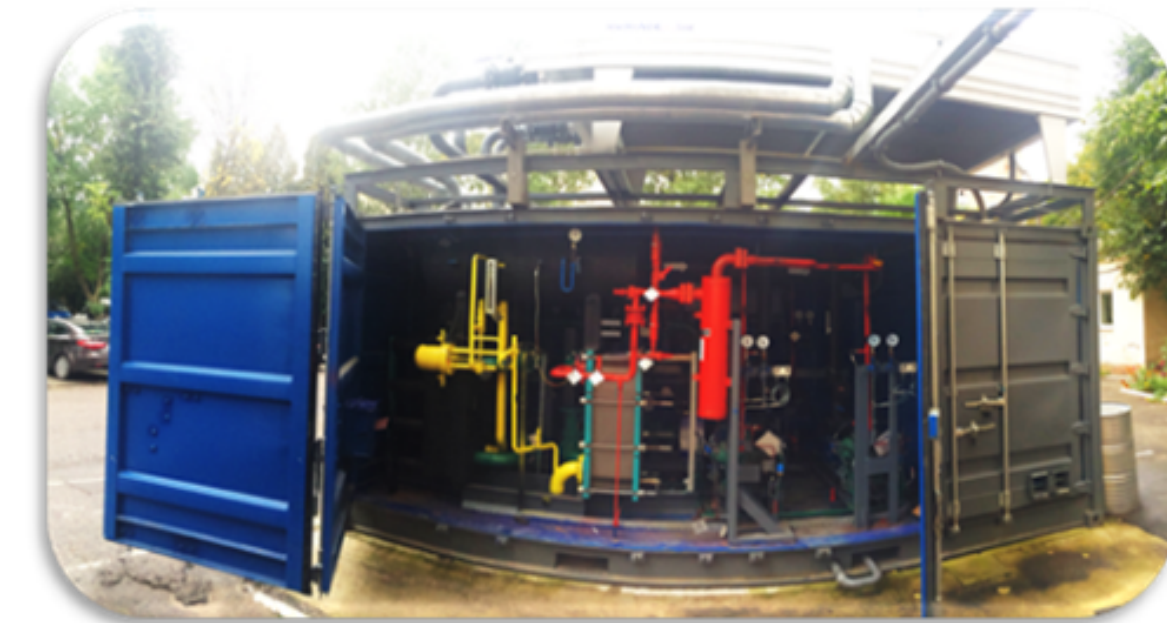


№ п/п	Options		Refrigerant			
			Propane R290	Carbon dioxide R744	Ammonia R717	Freons
1	ODP		0	0	0	0,02 &>
2	GWP		3,3	1	0	~1000-4000
3	Combustibility		+	-	+	-
4	Toxicity		-	-	+	-
5	Trained specialists	installation	_*	-	+	+
		adjustment	-	-	+	+
		service	-	-	+	+
6	Regulatory requirements for operation		Usage is limited	high pressure	Usage is limited	are withdrawn from circulation
7	The cost of refrigerant for 1 kg, euros		4-7	0,9	0,5	8-20
8	Safety Group (EN378)		A3	A1	B2L	A1

*In 2016 implemented pilot project «The Training class on the conditioners on propane» at the University

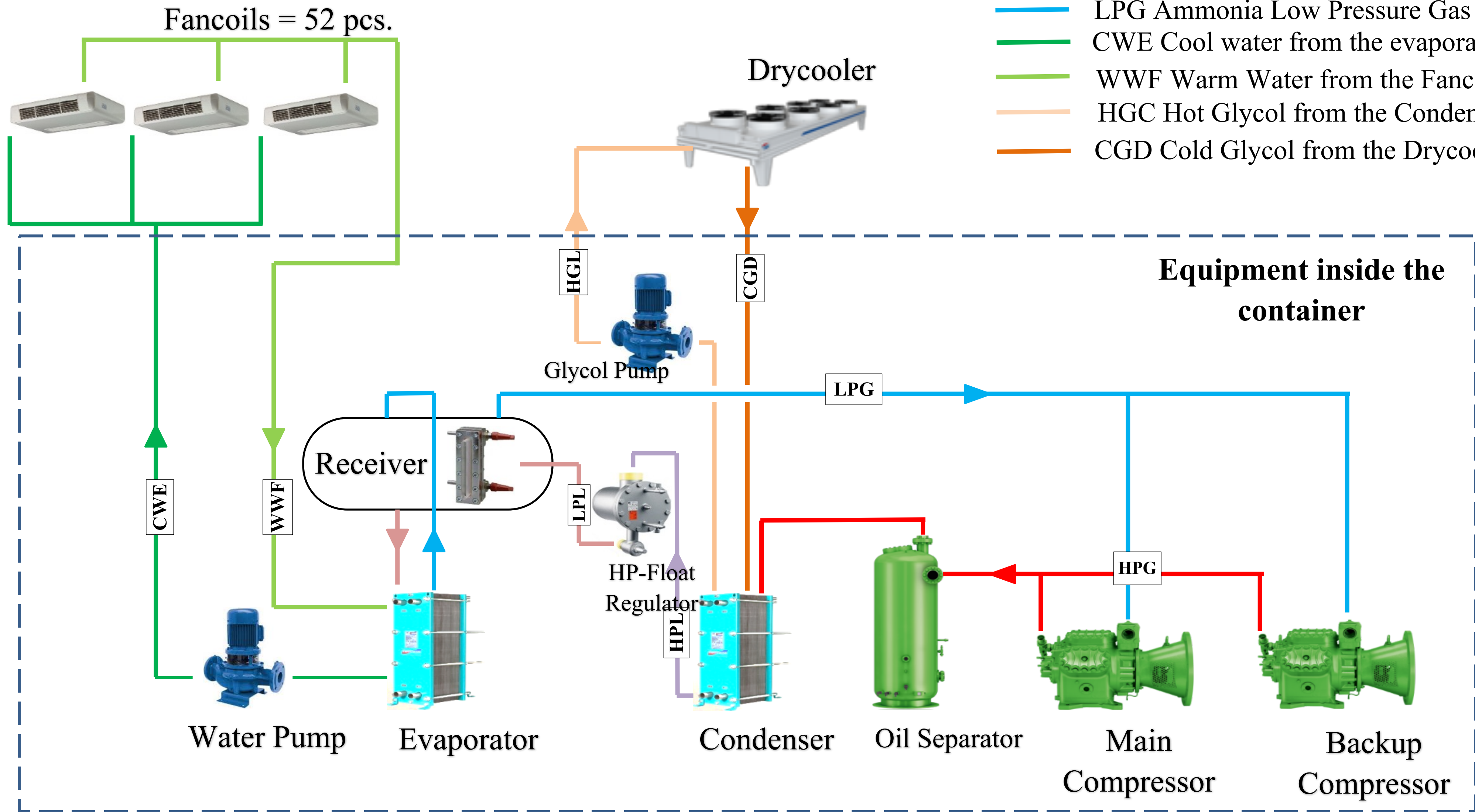
The main parameters of the ammonia chiller

- Cooling capacity - **125 kW**
- The boiling point of the refrigerant is + 10 ° C
- Ammonia charge - approximately **66 kg**
- The installed capacity of the compressor motor is 30 kW
- Theoretical **COP = 4.8**
- Chiller version: in a closed 20-foot container



System Design

- HPG Ammonia Hot Gas
- HPL Ammonia High Pressure
- LPL Ammonia Low Pressure Liquid
- LPG Ammonia Low Pressure Gas
- CWE Cool water from the evaporator
- WWF Warm Water from the Fancoil
- HGC Hot Glycol from the Condenser
- CGD Cold Glycol from the Drycooler



Concept

Features of the project

- ❑ This project is unique for the Republic of Belarus, because:
- ❑ The ammonia chiller is located in the center of the sleeping area of Minsk and is surrounded on all sides by residential buildings.
- ❑ There are no analogues of the use of an ammonia chiller for the air-conditioning system of office premises in Belarus (there are only cases of use in industrial plants for obtaining service water with specified parameters).
- ❑ We have applied all possible security measures that make the installation suitable for use in residential buildings.

The key drivers for increased adoption are:

1. Reduced charge systems not only in industry
2. Enlightened regulation
3. Design for lifetime operation and efficiency
4. Mobile installation

General refrigerant classification :

In contrast to the previous version of EN378:2008/2012, **A2L safety classification** is included with the revisions of EN378:2015 (release in 2017), ISO817 and SO5149.

Flammability and toxicity classification -
Group A2L **lower flammable 16% to 25%**.

*** In Belarus EN 378 was first put into operation in 1 May 2017 . But has a recommendation character**

Safety classification	Lower flammability level, % in air by volume	Heat of combustion J/kg	Flame propagation
A1	No flame propagation when tested at 60°C and 1013 mbar (101.3 kPa)		
A2 lower flammability	> 3.5	< 19,000	Exhibit flame propagation when tested at 60°C and 1013 mbar (101.3 kPa)
A2L lower flammability	> 3.5	< 19,000	Exhibit flame propagation when tested at 60°C and 1013 mbar (101.3 kPa) and have a maximum burning velocity of ≤ 10 cm/s when tested at 23°C and 1013 mbar
A3 higher flammability	≤ 3.5	≥ 19,000	Exhibit flame propagation when tested at 60°C and 1013 mbar

Barriers and solutions to hydrocarbons market uptake in Belarus

Manufacturers of ammonia equipment are guided by a high cooling capacity. Companies that produce the necessary equipment, I release it only under the order. This extended the delivery time of the component parts.

The next obstacle was the Belarusian legislation in the field of industrial safety. It should be noted that it is much more stringent than the European standard EN 387.

"The rules for the safe operation of ammonia refrigeration plants" of the Republic of Belarus are unified for any type of ammonia systems, from air conditioning to multitone refrigerating plants for large industrial enterprises.

It took us a lot of extra time and effort to bring the design solution in line with existing industrial safety requirements.



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Thank you very much!



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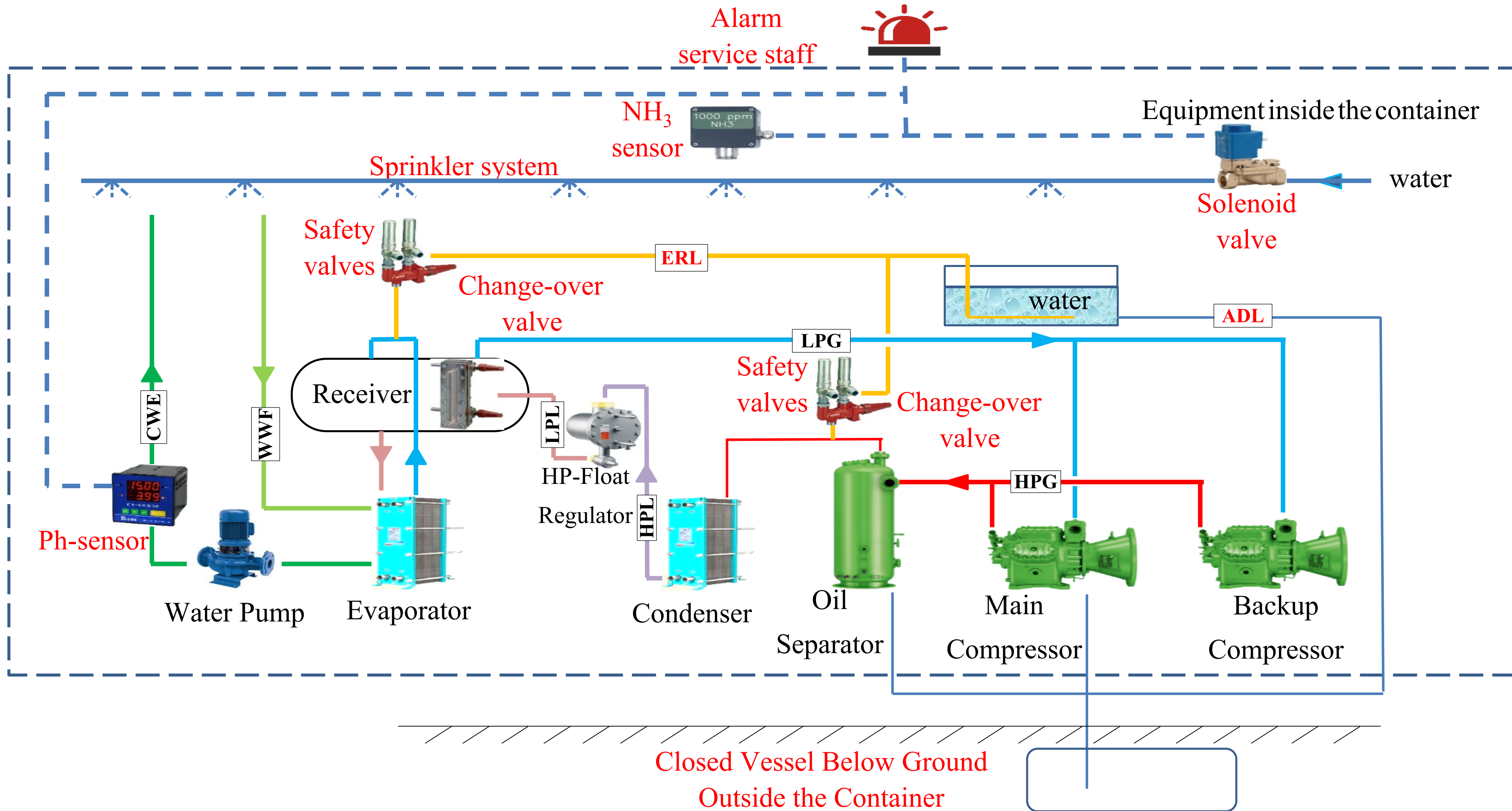
Find more information about projects and publications at:

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— ERL Emergency Relief Line
— ADL Ammonium-water Mixture Drainage line

TITLE

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TITLE Some additional issues requested in this presentation

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