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Cool Flash

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Editorial

As we come closer to another end of a very busy year, we have faced again challenges and issues, but we overcome them by working together, analyzing the situation and searching for the best solutions.
In this CoolFlash we want to share with you some more technical information and experiences.
As new editor of the CoolFlash, I want to invite you all to give us your feedback about the content and layout of this newsletter.

Enjoy reading it and hope to hear from you!

Katelijne Boens

In this edition :

FRICOM ENGINEERING & REFRIGERATION

Secondary coolant in refrigeration systems

By Mr. Leto (Fricom)

Fricom is an Italian based Engineering company, active in the development and consulting of professionals, active in using refrigerations systems in multiple applications.
Mr. Leto, director of Fricom, has favored the use of Zitrec products, and especially Zitrec S. The reason for choosing Zitrec S was the quest for optimal energy efficiency. This has now been achieved with a innovative system called the Thermofrost system.
Mr. Leto was so kind as to write us a description of what the system does with Zitrec S. Please feel free to contact mr Leto over our editor or via info@zitrec.com
Refrigeration plants with secondary refrigerants contribute to three major issues:

- Safeguarding the environment
- Energy saving
- Safety of "indirect systems"

The results of refrigeration plants with secondary refrigerant systems include lowering the high variation of refrigeration temperatures of supermarkets, food shopping mall, slaughter-houses, diaries, cold stores (example fishing boats and ship's stores), agriculture and food installation, walk-in freezers, etc.
The refrigeration system known as THERMOFROST-SYSTEM was developed from modern techniques of research and development in refrigeration. Its objective is to obtain a higher value of performance known as C.O.P. (Coefficient Of Performance)
This refrigeration system achieves the essential condition of reliability, flexibility and innovation.

- Primary Refrigerant: R-507
- Secondary Refrigerant: Zitrec S –40°C

TECHNICAL CHARACTERISTICS

1. In specific, the THERMOFROST-SYSTEM is built from compact refrigeration units with evaporators from a multi-stage exchanger; these are equipped with a sub-cooler in satellite mode.
2. The fluid in the storage tanks is horizontally stratified and achieve an important advantage:

From Arteco to Zitrec

Level of inhibitors is as critical in a product as the type of inhibitor technology applied in a certain product range — so be careful when topping up your system. Water can only be used in exceptional cases.

Zitrec Heat transfer fluids

FREEZIUM

Agenda

- 22 Nov — 23 Nov '07.
  Cool & Comfort
  Leuven — Belgium
  Come and visit Gasco/Arteco in 'Hal 1 — 113'
- 28 Nov — 1 Dec '07.
  Termoclima
  Rome — Italy
- 5 Feb — 8 Feb '08.
  Interclima 2008
  Paris — France

Secondary coolant in refrigeration systems
Continued

- Automatically adjusts the secondary refrigerant to the necessary temperature required for proper efficient cooling and defrost cycle
- With an external injection recycling system it is able to prepare the secondary refrigerant to the right, precalculated conditions.

3. This technology can be applied to any refrigeration unit, working from a temperature range from a level of –50°C to a higher level of +18°C.
4. The use of this system, compared to equivalent traditional direct expansion systems reduces the electrical energy consumption with values averaging from 30% to 45%, in every case where this technology was used to replace.
5. The dimensions, the potential capacity (over 50 kW) or diverse/similar refrigerant cold systems, do not limit or restrict the use of the system nor its energy-saving outcome.
6. The automatic regulation and distribution of the secondary refrigerant is obtained in quick and effective manner with motorized valves and flow regulators.

In conclusion the Indirect THERMOFROST SYSTEM is innovative in the used technology and in its energy savings.

Ref.: Thermofrost Base System (patent pending)

Read in the Press

Seriaco cools at Neuhauser

The article describes the cooling system at a Neuhauser-plant for the production of pre-cooked bread. For this unit, the choice was made on a NH_3/CO_2 installation. But the ammonia also allows the production of water/glycol mixture for the acclimatization and cooling down the processing equipment.

Source : Ria, la Revue de l'Industrie Agroalimentaire, May 2007

Aggreko freezes worlds biggest icerink in Biddinghuizen, Flevoland

The construction of an artificial icerink, FlevOnice, of no less than 5km is being finalised. These dimensions makes it quite a challenge for Aggreko, a company with dutch origin, but who is now based in Glasgow, and with many years of experience in the construction of temporarly icerinks. This project however is different : typically temporary ice-rinks remain only open for a few days, or a few weeks. This icerink will be open for about 100days/year. The biggest challenge is to guarantee a constant temperature.

The icerink is cooled with a **glycol**-mixture. On 7 places around the track, 24 big cooling machines are placed, each with their own pump. They all are connected to a central controller, named Argus. Via internet, so from a distance, these can be checked, monitored, and temperature of the ice can be regulated. Interesting also is the flexibility of this track : during summer months, the ice will be replaced by sand, and will be suited for other sportactivities such as horse-riding or cycling. FlevOnic will open on Dec 1, 2007.
More info on www.flevonice.nl

Source : Koude en Luchtbehandeling, September 2007.

Zitrec Heat transfer fluids — FREEZIUM

No installation is air-tight !

By Tom Lansbergen

Many people think their installation is fully air-tight after it is filled up with a heat transfer fluid and closed. But nothing could be farther from the truth!
There are many ways air can sneak into your installation, and some of them are not easily recognized as such.

First fill

The first pitfall where a large amount of air (and therefore, oxygen) can be dissolved in the heat transfer fluid (HTF) is during filling of the system. There are in fact two ways to fill a system and that is the right way and the wrong way: if the system is filled from the bottom up, then air is normally only present in the liquid as far as the physical saturation of the fluid will allow. At an atmospheric pressure and a temperature of 20°C the soluble amount of oxygen in water is about 8 ppm.

However, if the fluid is dropped from the top to the bottom, air pockets will be formed in curves, tanks, … and a lot more air will be trapped in the system. The air and other gases will be evacuated in large extent by de-aeration valves, but a much larger amount of air/oxygen will remain available in the system as compared to bottom-up filling methodology. As dissolved oxygen is a necessary reaction partner for corrosion, that accepts the electrons generated by the corrosion of metals, the present oxygen will be used during corrosion reactions. Lack of oxygen thus makes corrosion far less likely to occur.

After filling, the system is usually pressurized. This will increase the solubility of oxygen and other gases in the HTF!

Addition of water

A common practice is the addition of water when the level of fluid has dropped below a certain point. The fresh water will be the source of oxygen to continue a corrosion reaction. At the moment of opening the installation oxygen and CO_2 will be dissolved through the surface of the fluid.

Connections

Another common way of constantly introducing smaller amounts of air is by diffusion through elastic connections or plastic piping. This is even more pronounced at areas of higher temperatures. Degeneration of pipeworks due to an interaction with the heat transfer fluid, may further impede the pipeworks' resistance against air diffusion. This interaction can be mechanical or thermal stresses, leading to micro cracks, and/or external factors as oil contamination and UV degradation.

Tanks and expansion vessels

In tanks and expansion vessels the liquid can contract and expand by using free space above the liquid surface. Usually this space is filled with air, but in some cases an inert gas may also be used. The latter is certainly preferable but not always possible. Or one may use a membrane technique to separate the air or gas from the liquid. If however the space is filled with air, and no membrane is used, there will be constant introduction of air through the liquid surface into the heat transfer fluid.

The use of none or poor inhibited fluids, as is the case in domestic heating installations, is not a valuable option for those HTF cooling systems. Next to the high temperature also the continuous release of air/oxygen into the system creates an environment where a need is present for fast and effective corrosion inhibitors.
Reducing the likelihood of air intake will give your installation a longer life-time and reduce corrosion rates. But because no system can ever be perfectly airtight, OAT (Organic Acid Technology) technology — as used in Zitrec M, L, A and S — will offer you the cutting edge you need with fast, selective and long-lasting inhibitor action, from the first fill onwards.

High temperature stability of heat transfer fluids and coolants

By Sandra Claeys

Being responsible for transporting the heat in a diversity of applications, ranging from industrial or even domestic applications such as solar panels, a critical property of a heat transfer fluid is its high temperature stability. This characteristic is not only critical in industry, it also gained importance in automotive and heavy duty engine applications. It is known that modern engine technology requires increased power output, and simultaneously the quest for better combustion both lead to increased temperatures in engines.

The same is true for industrial applications: installations are used to their maximum output levels, energy efficiency is improved to its limits. And so the heat transfer or cooling media must follow.

What impact may high temperatures have on the heat transfer fluid or coolant?

Already a long time ago mono ethylene glycol (MEG) was selected as most common base fluid because of its balanced performance on properties like heat transfer and freezing protection. Despite the many advantages in different applications, glycols will degrade at higher temperatures. Under higher temperatures combined with the presence of oxygen, a radical oxidation reaction takes place resulting in the formation of glycol oxidation products such as formic and glycolic acid. These changes illustrate the potential risk of high temperatures on the fluids' properties such as pH, additive stability and corrosion protection performance. In case one of these properties is out of balance this can result in deposit formation having a negative impact on the heat transfer characteristics of the fluid. Finally this results in increased maintenance of the application and in the worst case in failure.

Recently a study was conducted on a selection of MEG based products, representing currently available technologies in the market, towards their high temperature oxidative stability.[1] Next to the determination of glycol breakdown products, the work also looked at the effect of high temperatures on pH, additive stability and corrosion protection properties. A detailed description is provided of the high temperature test set up, in which the fluids (50v% dilution in water) are heated up to 185°C during several days in a pressure resisting stainless steel container.

The results of the test indicate that the MEG base fluid is indeed susceptible to oxidation under high temperature conditions. Although the same base fluid is used for all the tested products, ***its main conclusion is that the additive package has an effect on the amount of glycol degradation acids formed***. It could be concluded that the use of Organic Acid Technology (OAT) corrosion inhibitors provides advantages towards the oxidative stability of the base fluid. Especially the products solely containing OAT corrosion inhibitors (such as in Zitrec MC) appeared to have the highest stability after being tested under more extreme conditions. This type of technology appeared to have the highest additive stability and was able to keep efficient corrosion protection performance to different metallurgies after being aged under high temperature oxidative conditions.

Where earlier studies and experiences have illustrated the importance of the stability of heat transfer fluids and engine coolants under normal operating conditions, this study indicates that the choice of the additive composition becomes even more vital at elevating temperatures. For industrial applications, Zitrec MC has demonstrated to contain an additive technology, which is stable under high temperature oxidative conditions and therefore allowing the heat transfer fluid to maintain its performance even under more severe conditions.

[1] S. Claeys; S. Lievens *Journal of ASTM International*, Vol. 3, N° 10

Readers corner

Do you have comments or feedback? Want to share experiences with other readers … this is where you can do this. This is yóur corner! A selection of comments will be published here.

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