ARTECO
A Joint Venture Company

Cool Flash

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Editorial

Although it is too early for typical end-of-the-year messages, I'd like to take already a small glance back at 2006.
Like every year, 2006 also had its share of challenges and issues. Yet, with the implementation of SAP, our new ERP-system, Arteco probably has dealt the biggest internal projects so far. Nobody will say it has been easy, and still many issues need to be resolved, but our teamspirit has made it a success!
This same spirit is also our approach with our customers : analysing and understanding the issues, and working together to the most appropriate solution.
In this Coolflash, we share with you again a list of our projects.

Els Quintyn

Transforming Calcium Chloride systems to Zitrec S or Freezium

By Tom Lansbergen

It is widely known that a $CaCl_2$ system generally suffers from quite heavy corrosion. Why does this corrosion take place?

The main reason is the presence of the corrosive chlorine ion. This ion is the driving force in corrosion processes in such systems and is responsible for so called "pitting corrosion". Studies have pointed out that above 50ppm of Cl^- present in water a SS304 plate will have hundreds of pits, of average 3mm depth after only a few months. In order to create the same effect on SS316 one needs 100ppm of Chloride. Of course, a $CaCl_2$ system will generally contain a multitude of that: up to 20 – 30% concentrations are normal.
This means the metal surfaces of compounds are under constant corrosion stress, and even the best inhibitors are unable to bring those processes to a halt.
That is why more and more industries tend to move away from $CaCl_2$ and move toward less aggressive salts such as Zitrec S and Freezium.
One of the reasons is that Freezium and Zitrec S have similar or better thermal characteristics on specific heat, viscosity and heat conductivity. In some of the usual application areas that makes them theoretically interchangeable.

There are some precautions that need to be taken when changing over from CaCl2 systems to Freezium or Zitrec systems. The first and most important prerequisite is that the system needs to be thourougly flushed and cleaned. The goal of this is to get out as much of the Chlorine as possible. Regular pH checks during flushing are necessary and even a neutralizing agent may need to used.

If you are considering such a change or you want to evaluate the pro's and contra's of a changeover, do not hesitate to contact your local distributor!

In this edition :

From Arteco to Zitrec

Indirect cooling systems. Also known as secondary refrigeration, are a big application area for our heat transfer fluids. Indirect systems offer many benefits versus direct systems, such as lesser charge of primary refrigerant and less risks for refrigerant leakages, less severe requirements on piping and pumps, and a smaller installation in general.

Zitrec Heat transfer fluids

FREEZIUM

Freezium - a superior brine for climate-chambers and wind tunnels

By Pontus Holmström (Stainless Engineering)

Sweden has a good reputation regarding the quality of its automotive industry, with well-known brands such as Scania and Saab Automobile ; both are also well-known for their environmental concerns, design and performance. And they both chose Freezium for their converted wind tunnels using York Refrigeration as the entrepreneur.
First out was Scania in 2001, which due to its environmental policy wanted to replace its Freon-based DX system with an indirect system using ammonia. Silicone-based thermal oils were an alternative but a thorough analysis showed that Freezium was superior both regarding thermal, cost-effective and environmental aspects. Today, 5 years later on, we can say that the unit has been problem-free and that the customer is very satisfied. The same applies to SAAB Automobile (General Motors) which for similar reasons wanted to replace its DX system in 2002 with Freezium. Even this unit has worked without problems.

There are two types of wind tunnels, namely large ones where the whole chassis with components such as climate systems etc. can be tested and smaller rooms for testing engines. The chassis and components can be tested in these areas under the most extreme conditions within arctic and tropical surroundings. Therefore it must be possible to vary the temperatures between -45°C and up to + 84°C which makes great demands on the thermal properties of the brine. Freezium (potassium formate salt in 50% water solution, with corrosion inhibitors) has proved to be a superior agent and also cost-effective.

The CO_2 system, which today competes with Freezium in low temperature applications, cannot be used in these wind tunnels because the system pressures become too high to cope with the "tropical" conditions.

There is, of course, a range of other machines and equipment, apart from cars and lorries that has to be tested in climate chambers, so the market for Freezium in this niche is potentially considerable.

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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Customer that put their trust in us!

Via our Coolflash, we want to inform our readers of projects in which the benefits of our heat transfer fluids have been proven. Just a few recent exemples....

- Zitrec MC and M-25 in a chemical plant in Germany
- Zitrec M in flower auction hall in the Netherlands
- Zitrec M as a retrofit in to an Olympic ice rink in Sweden
- Zitrec S into several supermarkets as a retrofit in Italy
- Zitrec F for wine production in Italy
- Zitrec A used in airport building facilities in Ireland
- Zitrec L used in solar panel applications in UK

Contact us if you would like more information on one of these applications, and see how our heat tranfer fluids can also benefit in your installation.

Evaluation of Pressure drop & Pumping Power differences.

Suppose we have an application using a cooler operating at -30°C, where we will use a Zitrec S -40°C and an MEG (Zitrec M) and MPG (Zitrec L) based coolant offering the same freeze protection as well as a popular product based on potassium acetate and formate. Table 1 shows their properties.

Table 1 : properties of Zitrec S, L and M, exported from our ProZit properties database; except for the potassium acetate/formate mixture

Properties at operating condtions	**Zitrec S**	**Zitrec M**	**Zitrec L**	**Potassium Acetate/Formate**
Density (kg/m3)	1288	1097	1065	1225
Kinematic viscosity (mm2/s)	15.7	42.4	372	23.96
Specific heat (kJ/kg K)	2.7	2.92	3.26	2.875

The calculation will suppose that the same amount of heat is to be transported and that the same ΔT is to exist over the heat exchanger.

Using the formula $Q = \rho.c_p.V.\Delta T = c_{p,v}.V.\Delta T$

we can substitute all values of the MEG (Zitrec M) and the MPG based coolant (Zitrec L) as well as the values for Zitrec S and devide them by each other, giving the ratio between both volume flows necessary to 'transport' the heat load.

$$\frac{c_{p,v,ZitrecM}}{c_{p,v,ZitrecS}.} = \frac{V_{ZitrecS}}{V_{ZitrecM}}$$

Typical fluid flow of a secondary system running on a heat transfer fluid in general is supposed between 1 and 1.5 m/s. All fluid will have very similar volume flows.

Remark: In reality the temperature difference that needs to be generated will be different for the different fluids used. Especially a higher thermal conductivity of the fluid will have a beneficial effect and lower the required ΔT. Calculation is however not straightforward as it will depend of the total heat transfer coefficient over the heat exchanger, in other words also the material cooled/heated as well as the heat exchanger itself will play an important role.

Calculation of Reynolds number from this data:

Suppose the heat exchanger uses piping diameter 20 mm=0.020 m

$R_e = \frac{d.\rho.w}{\mu} = \frac{d.w}{\nu}$ >2,200 (indicating turbulent flow for heat transfer purposes)

(cont'd next page)

Calculation of pressure drop:

Suppose the length of the tubes to be 5m in the cooler. For turbulent flow regimes the pressure drop will be:

$$\Delta p_{turb} \cong \frac{0.092.\rho.w^2.L}{d.R_e^{0,2}}$$

In the case of laminar flow, the pressure drop will be:

$$\Delta p_{lam} \cong \frac{32.\rho.w^2.L}{d.R_e}$$

Pumping power:

$$P = \frac{V.\Delta p}{\varepsilon_p}$$

In the case of one fluid being MEG based and the other Zitrec S the formula is:

$$\frac{P_{MEG}}{P_{ZITRECS}} = \frac{(\frac{V_{MEG}.\Delta p_{MEG}}{\varepsilon_p})}{(\frac{V_{ZITRECS}.\Delta p_{ZITRECS}}{\varepsilon_p})} = \frac{V_{MEG}.\Delta p_{MEG}}{V_{ZITRECS}.\Delta p_{ZITRECS}}$$

Results are these calculations are given in table 2.

Conclusion:
- **171% more power is needed, comparing Zitrec M with Zitrec S**
- **1866% more power is needed, comparing Zitrec L with Zitrec S**
- **42% more power is needed comparing the Potassium Acetate/Formate product with Zitrec S**

Table 2 : Results of calculations

	Zitrec S	Zitrec M	Zitrec L	Potassium Acetate/Formate
Specific volumetric heat (kJ/L K)	3,48	3,20	3,47	3,52
Volume flow ratio (vs Zitrec S)	1,00	0,92	1,00	1,01
Fluid speed (m/s)	1,50	1,628	1,502	1,481
Reynolds number Turbulent or laminar	1.911 Turbulent	768 Turbulent	81 laminar	1.236 Turbulent
Pressure drop, Pa Bar Ratio (vs Zitrec S)	 12.133 0,120 100%	 30.298 0,299 250%	 238.098 2,350 1962%	 17.389 0,172 143%
Pumping power ratio (vs Zitrec S)	1,00	2,71	19,66	1,42

Agenda

- 27 Feb - 01 Mar '07.
  RAC 2007
  Birmingham - UK
- 28 Feb - 03 Mar '07.
  Climatización
  Madrid - Spain
- 6 Mar - 10 Mar '07.
  ISH
  Frankfurt - Germany
- 13 Mar - 16 Mar '07.
  Climate World
  Russia — Moscow

Arteco Exhibits in IKK 2006

By Tom Lansbergen

Arteco was present on this year's IKK on stand 5-316. On display were all major products, with the message "Long Life Inhibitor Technology".
Zitrec means heat transfer fluids with appreciably longer life as compared to traditional types of fluids. This message was supported by our Zitrec long life beer, which has become very famous!

Compared to other years, Arteco may say that the amount of visitors has grown a lot. As a fairly young brand in the market place, we see a gradual growth of the reputation of Zitrec products. It is apparent that our brand is getting more and more well known. On the other hand, from the conversations that we all had during the exhibition we can still draw the conclusion that corrosion issues are still around with glycols or brines, even in water containing systems. All of these are areas where Zitrec may be the potential solution.
Also heat transfer efficiency is a central theme that keeps on re-occurring. Circulation pump damage in seals and housings are still a "hot" item.
As a conclusion we at Arteco were very happy with the general response and for all of those who paid us a visit: may we thank you all!

READ IN THE PRESS

Just before IKK 2006, specialised press was full of speculations, comments, and articles on the future of IKK. At IKK, VDKF shed some clarity in the darkness, again intensively published in the press. Below of summary of press-articles :

Initial discussions dealt about yearly concept of IKK. Some people were in favor of keeping it annual, be it Nurnberg or Hannover, others wanted to go for a 2-yearly exhibition, only in Nurnberg. In the end VDKF, owner of the IKK show, decided to make a complete turn-over, and has decided to go to a 2-yearly exhibition at the new exhibition area in Stuttgart. The latter still being in construction, will have direct access to airport, autobahn and train. The first IKK at this new location will be Oct. 2008 (8-10/10).
This means, this years IKK in Nurnberg was the last ever. Next years IKK in Hannover has been cancelled, but VDKF announced to reserve in 2007 space area at ISH/Aircontec in Frankfurt.

However, a group of exhibitors strongly disagree with this move, and still support Nurnberg as exhibition area. This new exhibition has been named Chillventa, and the first one will take place … also in Oct 2008! (15-17/10).

The exhibitors group fears that the approach from VDKF will be disastrous, namely that visitors in 2007 at ISH will be disappointed because they're expecting the 'old IKK'. They also fear that the switch in location will lead to lesser exhibitors and visitors. For Chillventa, the exhibitors' group has announced to reduce stand space costs, and increase budget for advertising and promotion.

On the other side, VDKF accused the group of exhibitors from being 'inward looking and not looking at the wider international market'. VDKF president Christian Scholz said that the group consisted of '20 traditional companies, to be taken seriously, but only account for ~6000m^2 of space'.

So the split up between IKK exhibitors and VDKF will result in 2 exhibitions in 2008, with only 1 week of difference : IKK in Stuttgart, and Chillventa in Nurnberg.
On the clash of dates, VDKF president commented 'I am convinced there will be only 1 show, and that is Stuttgart'.

Sources : Koude en Luchtbehandeling, september 2006 and ACR News, October & November 2006

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