



ENERGY SAVINGS NANOFUID

www.htfcompact.com



Debate article on Nanov liquids and when does the benefit of society outweigh the environmental risk?

Nanotechnology has come to stay.

The market for commercialization of nanotechnology is undeveloped with the exception of medical technology. Development in the construction sector is hindered in part by shortcomings in customer competence in procurement and by concerns among players that the health and environmental effects are still unclear. It slows down the development and introduction of a societal benefit, mainly in heating and cooling systems where large societal benefits can be achieved quickly and easily. We are talking about an energy saving potential of about 30% / year with an equally large reduction in CO₂ emissions. With the help of nanotechnology, global goals of most sustainability goals such as clean water and sanitation (6), sustainable energy (7), but above all the more comprehensive goals of sustainable consumption and production (12) and combating climate change (13) can be achieved.

But do the environmental risks outweigh the great benefits that society, companies can achieve by using modern technology? I can see many counterproductive measures today between different authorities that make it difficult to introduce new products on the market.

In the construction industry, people are afraid of new asbestos and PCB problems, and it is old ghosts that we must try to get out of the debate about the new old nanotechnology.

Do nanoparticles have a negative impact on us?

In order for the toxic risks of a product to be low, one of the following assumptions must be true: (1) no toxicity to organisms can be measured or (2) there is no way that the material can reach organisms, e.g. due to the fact that the material binds strongly to certain reactive surfaces in the environment and thus can no longer be transported. In both cases, a new product can never harm organisms.

Nanoparticles that have been produced to date have proven to be relatively harmless to the public. At the Department of Land and Environment in SLU, Sweden, researcher Knapp Karin Norrfors investigates, among other things, how nanoparticles are transported through the earth. Their high reactivity means that they have a high affinity for soil surfaces, which in turn means that nanoparticles are only transported over short distances in the earth and thus only in exceptional cases reach the groundwater.

The more reactive nanoparticles such as silver nanoparticles (used for their antibacterial properties), also do not reach the environment in the original reactive form. Instead, it eventually ends up in treatment plants after they are used, and research there has shown that the nanoparticles are transformed into less reactive forms.

Do we need to worry?

No not at all. Nanoparticles in sunscreen will accumulate in our immediate environment but have been shown to be harmless, so you can continue to protect yourself from the sun. However, nanotechnology is evolving into increasingly complex materials that may have new, unknown effects on humans and the environment. Compared to ten years ago, however, we are much better prepared to be able to estimate the potential risk for these materials. Today, there are also technologies for us to be able to measure them in the environment, which benefits a sustainable use of the new products.

From source <<https://www.slu.se/forskning/kunskapsbank/mark-miljo/nanopartiklar/>>

The EU has invested a lot of money in this research where KTH, Chalmers, RISE and others have received large funds for their part of the research, and there is still a lot of research but little has come on the market as commercial products. Below is a short summary of the project goal.

Nanohex. See. [The Project | nanohex.eu](#)

Nanohex

The world's largest collaborative project for the research and development of nanofluid coolants, NanoHex comprises of a consortium of 12 leading European companies and research centres. The €8.3 million project has been funded by the Seventh Framework Programme grant, together with investment from the consortium themselves. Initially promoted by the Italian based research and development company ISIS R&D, in collaboration with European Industries and Universities, and using promising research results from previous works carried out by the consortium NanoHex aims to develop and optimise safe processes for the production of high performance nanofluid coolants for use in industrial heat management. It will also endeavour to develop an analytical model that can accurately predict the thermal performance of such nanofluid coolants; something that has not yet been achieved.

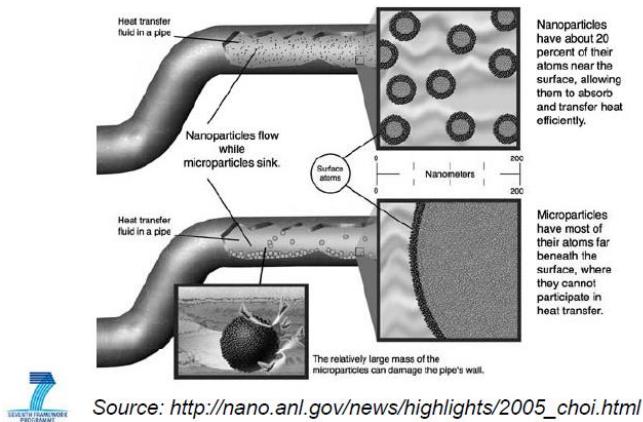
Nanofluids have shown significantly enhanced thermal properties in comparison to traditional cooling fluids and by coupling significant technical benefit and commercial viability with environmental friendliness, NanoHex aims to produce a nanofluid that can be safely manufactured, applied and recycled.

The efficient removal of heat is one of the top challenges facing a number of industries, including microelectronics, transportation, manufacturing and power generation. With existing cooling technologies reaching their limit, innovative and more efficient cooling technologies are needed to support technological development and reduce the impact such technologies have on the environment. The nanofluid developed will be applied in demonstrative cooling systems for both Data Centres and Power Electronic components to illustrate how nanofluid may help to extend product reliability, reduce energy consumption, lower operating costs, cut carbon emissions, and ultimately, enable the development of more sustainable products and processes within industry.

Why add nanoparticles to fluids?

- Due to their nanoscale, nanoparticles can form **stable suspensions** in fluids compared to micro-particles.
- They have offer **higher surface area** allowing better heat transfer to between the base fluid and the dispersed nanoparticles.
- Particles have much higher thermal conductivity than base fluids.

Why Nanoparticles Are Better Than Microparticles

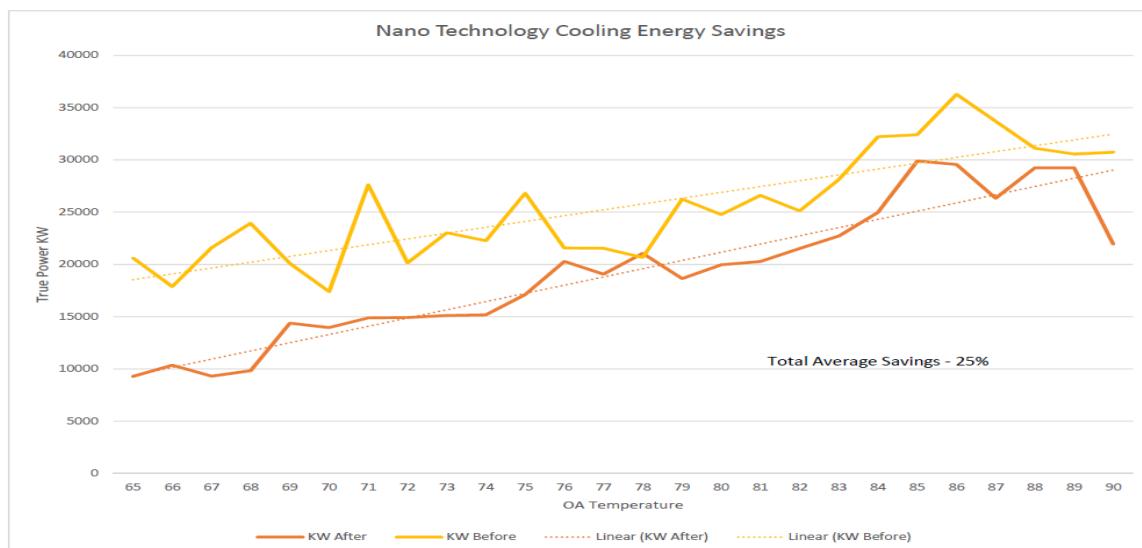


Source: http://nano.anl.gov/news/highlights/2005_choi.html

- Compared micro-scale particles, nanoparticles have **less adverse impact on industrial equipment** with respect to erosion and settling.

NanoHex[®]
Enhanced Nano-Fluid Heat Exchange

Now there are finished products on the market from Italy that are leaders in this technology and various reference Cases that show great measurable benefits in the US in real estate and greenhouses and in France of our product in a large yogurt factory where they have now gone from Pilot installations to full-scale installation in all heating and cooling processes in closed systems. The road from the first commercialization to today's date is long. The product came on the market in 2014 after about 10 years of research and development, but now the time is ripe to look at the societal benefits of the risks with this new technology. Below is a graph from the factory in France over about 6 months.



Risks with Nanov liquids in closed systems.

What does "risk" mean?

Geert Cornelis (researcher at the Department of Soil and Environment at SLU) has researched in risk assessment of nanoparticles since the research area was new, ie. a little more than ten years ago. At that time, it was judged that the uncertainty in the growing nanotechnology production risked affecting the environment and human health.

- One of the biggest challenges in this new area was to be able to handle and study the particles. Risk assessments in classical environmental chemistry only handle chemicals that dissolve and are transported with water flows such as pesticides. Nanoparticles, on the other hand, behave in a completely different way, both in terms of transport and bioavailability. This has led to many new scientific questions.

However, risk assessment is not just a scientific issue. Actually, there are no products that are 100% risk free in all conditions. A small, but still measurable, risk is therefore always allowed by politicians, especially when the benefits of a new product can be clearly demonstrated. An overly cautious attitude can also delay the development of new products and thereby weaken international competitiveness for Swedish and European industry.

In a closed system, liquids move in a controlled manner and under the supervision of various measuring functions.

Our liquid consists of 5% of the system's total volume and has a large dilution capacity that reduces the risk of creating toxic environments for those who work with the products or for surrounding environments.

The product is built around copper oxides that are not considered dangerous to humans.

The graph

Graphene is a nanomaterial in the form of a network of carbon atoms arranged in hexagons. The graphene has high flexibility and a large specific surface area (Kemikalieinspektionen, 2016). Graphene has high strength and is stronger than steel. It also has excellent thermal and electrical conductivity properties. The material can be used in coatings, sensors and simpler energy storage products.

SUMMARY of HTF Compact Safety Data Sheet

Copper (II) oxide *

The product is not classified as dangerous for aquatic organisms. However, apply the precautionary principle and avoid discharge into drains or watercourses. See more on our safety data sheet at www.nxnano.one.

The benefits and experiences with Nano liquids in closed systems

CO2 reduction

The reduction of 950 gr CO2 / Kwh gives a measurable reduction in CO2 emissions in the same size as in KWh, which is a lot and should weigh heavily in all decision-making processes.

Energy savings

We guarantee an energy saving saving of 25% with the help of HTF Compact alone, but often the savings turn out to reach 30-35% when equipment and other things are tuned and the measurable aggregate savings will then be much larger.

Extended service life of pumps and other heating and cooling equipment

It has been shown in countless measurements that the service life of equipment is extended, which also provides large capital savings and provides a better LCC value.

Profitable

A payoff of less than 2 years is profitable and a technical life of about 20 years, with Green loans and with local government Energy grants of up to 50% in Europe, it is a very good investment.

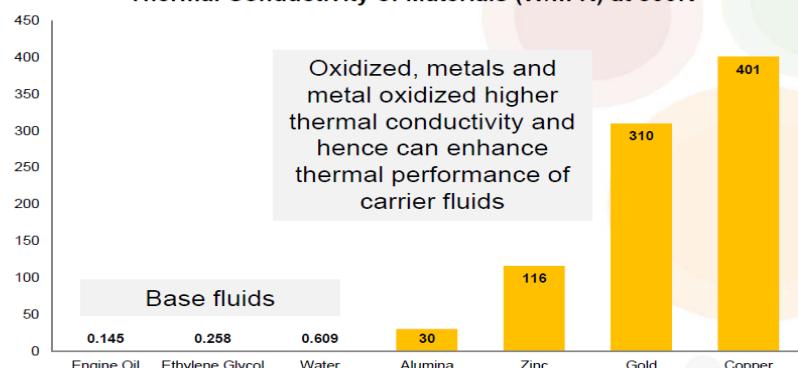
Value calculation

With the help of nanotechnology, global goals of most sustainability goals such as clean water and sanitation (6), sustainable energy (7), but above all the more overarching goals such as sustainable consumption and production (12) and combating climate change (13) can be achieved. With today's energy shortages in the Global transition to more fossil-free energy, nanotechnology, primarily in heating and cooling, can be drastically reduced.

Thermal Nanofluid Concept

HENIX 228882 Project

Thermal Conductivity of Materials (W/m K) at 300K



- Addition of nanoparticles will increase the thermal conductivity of base fluids leading to better transport properties

Source: Thermal conductivity values:
http://www.engineeringtoolbox.com/thermal-conductivity-liquids-d_1260.html
http://www.engineeringtoolbox.com/thermal-conductivity-d_429.html

NanoHex
Enhanced Nano-Fluid Heat Exchange



With this brief summary, I want to show that the benefits of closed heating and cooling systems outweigh the small environmental risk that an implementation of HTF Compact poses.

However, risk assessment is not just a scientific issue. Actually, there are no products that are 100% risk free in all conditions. A small, but still measurable, risk is therefore always allowed by politicians, especially when the benefits of a new product can be clearly demonstrated. An overly cautious attitude can also delay the development of new products and thereby weaken international competitiveness for Swedish and European industry.

There should be many private property owners who want and can test the product now that the incentives are high with Energy subsidies for energy savings in residential properties and small and medium-sized companies that use a lot of heat and cold in their processes and where there is now a new Energy Saving program from the EU.

Energy efficiency operations in small and medium-sized companies!

Energy efficiency is about finding methods and new technology to use energy as resource efficiently as possible for both companies and society.

We are looking for partners within HVAC around Europe and in Scandinavia.

Contact me, Nils and visit our website www.nxnano.one

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