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EDITORIAL

In today's ever-changing world, one continually hears about how the speed of business is accelerating. Time is money, and generally individuals and businesses operate at optimum efficiency when they focus on their area of expertise. This drive for efficiency leads to outsourcing, where businesses elect to turn over certain parts of their operations to an outside specialist, enabling the businesses to focus their efforts on their internal strengths.

Trends in the pipe world are no different, as more and more customers look to KWH Pipe not only to supply them with their piping needs but to provide them with the solution to their problem. KWH Pipe's history and the global nature of its business make it unique among its competitors in its ability to provide solutions to customers.

Historically KWH Pipe has been a leader, utilizing its polymer knowledge and extrusion expertise to introduce polyethylene pipe into larger-diameter and higher-pressure applications. Combined with a complement of highly skilled engineers, knowledgeable in installation and construction techniques, this enables us to offer solutions to customers ranging from pipe supply through to turnkey installations. Additionally, our R&D department focuses on developing processes and technologies that help provide solutions for our customers' piping needs.

Inviting us to participate in the piping design process at an early stage provides the best opportunity for customers to benefit from our knowledge and experience in providing piping solutions. KWH Pipe is committed to the success of your project, knowing that 'Our Customer's Success is Our Success'.

Providing solutions to our customers has always been one of KWH Pipe's strengths. The Industrial Applications market sector has been quick to embrace the piping solutions concept. In this issue of Pipe World, we focus mainly on a variety of different industrial applications where KWH Pipe's knowledge and capabilities were instrumental in providing the best solution for our customers' piping needs.

Paul van Warmerdam

President and CEO, KWH Pipe (Canada) Ltd and Executive Vice President KWH Pipe Group, North American Operations



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news

POPULARITY OF DOUBLE-WALL PIPING SYSTEMS INCREASES IN POLAND

For many years now, construction in Poland has shown robust growth. The steady flow of EU funds for infrastructure projects is likely to maintain this growth, even with the current turbulence in the world economy. As Poles are looking for affordable and smart ways of construction, the market share of polyethylene and polypropylene piping systems is rising at the expense of less advanced materials.

Weholite has long been popular in Poland for large-diameter gravity applications and now, in order to satisfy the demand for gravity pipe systems of smaller diameters, KWH Pipe Poland has launched WehoDuo ID in sizes DN/ID 150–400 mm. It is a double-wall pipe system that has a smooth inner layer and a corrugated outer layer and is primarily used for storm drains. This structure, together with the polypropylene material, ensures high ring stiffness and low weight, making it a durable piping system, complete with fittings, that is very easy to install.

Read more at www.kwh.pl.



WEHOLITE GUARANTEED SOLUTION IN ASIA AND NORTH AMERICA

In late 2007, customers and other stakeholders in piping projects worldwide were asked to describe the challenges they have encountered in their piping projects and to propose suggestions for making the projects more successful. Using the answers from this survey, KWH Pipe has brought marketing, sales and product development staff together in a project to develop a concept that would satisfy these needs. The project goal was to provide a piping solution which would have a superior life-cycle value and which would minimize risk and trouble at the planning and construction stages, as well as during the actual period of operation.

The result was the Weholite Guaranteed Solution, a unique concept that builds on the strengths of the Weholite pipe system and the skills and experience of KWH Pipe. It aims to be the best long-term solution for gravity and low-pressure transport of water and waste water that offers superior life cycle value and quicker, more economical installation than less advanced materials. The concept will focus on selected application areas and include services offering improved convenience for everyone involved.

The Weholite Guaranteed Solution is an addition to the current product portfolio as a complement to standard Weholite. It will be launched in North America and Thailand in April 2008. The new concept is so far not being offered in Europe.

KWH PIPE MOVES TO NEW FACILITIES IN ST. PETERSBURG, RUSSIA

On 14 April, in view of business expansion, KWH Pipe (both Pipe and Technology sales) moved to a larger, more comfortable office. Situated in the 'Lakhta' Business Centre near the metro, the new location is more convenient for clients and their representatives.

The new address is:

ZAO KWH Pipe
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Optikov str., 4, building 2,
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Charlotta Risku



Patrick Jansson



Jan Hägg



Teemu Jutila



Peter Gardberg



Camilla Kojonen

KWH Pipe Group

Mr Jan-Erik Nordmyr M. Sc. (Econ.) has been appointed President and CEO of KWH Pipe Ltd as of 1st May 2008. He has previously worked as Deputy Managing Director and Area Director for KWH Pipe's European operations, in which position he continues for the time being.

Product and Production Development

Mrs Charlotta Risku M.Sc.(Tech.) has been appointed Product Manager for WehoSlurry pipe systems as of 15 November 2007.

Mr Patrick Jansson B.Sc.(Eng.) has been appointed Product Manager for WehoAntistatic pipe systems as of 15 November 2007.

KWH Pipe Europe

Mr Jan Hägg M.Sc.(Eng.) has been appointed Manager, Environmental Business Development, as of 1 January 2008.

Mr Teemu Jutila M.Sc.(Chem.) has been appointed Product Development Manager, Environmental Business Development, as of 1 January 2008.

KWH Pipe Finland

Mr Peter Gardberg M.Sc.(Econ.) has been appointed Purchaser as of 1 January 2008. He has previously worked with export sales in KWH Pipe Finland's customer service.

KWH Thermopipe

Ms Camilla Kojonen M.Sc.(Econ.) has been appointed Business Controller (substitute) as of 14 February 2008. Her tasks include business control for KWH Thermopipe's operations in Finland and Sweden.

KWH PIPE SIGNS DISTRIBUTORSHIP AGREEMENT IN THE NETHERLANDS

Wholite products have been available on the Dutch market for several years. KWH Pipe and NKI Neede recently formalized their cooperation by signing a distributorship agreement. For NKI Neede, this means access to more extensive technical and marketing support from KWH Pipe, and for Dutch customers, it no doubt means that they will see Wholite used in an increasing number of applications that improve their living environment.



NKI Neede is an independent, all-in-one supplier of plastic pipeline systems and has been active in the Dutch market for more than 25 years. It consists of four divisions: Infiltration Equipments, Pipeline Systems, Customised Prefab Work and Welding Equipment Leasing. Upcoming issues of Pipe World will undoubtedly feature some of NKI Neede's recent projects. For more information, visit www.nki-neede.nl

KWH PIPE PROVIDES AITIK 36 WITH A POLYETHYLENE PIPING SOLUTION

KWH Pipe has signed a contract with Boliden to supply the Aitik mine with polyethylene piping systems for transporting slurry, raw water and process water. When Boliden doubles its ore production at Aitik, near Gällivare in Sweden, from the current 18 to 36 million tonnes per year, the aim is to create one of the world's most efficient mines and improve competitiveness. Another important benefit of the investment is improved environmental performance.

KWH Pipe will provide Aitik with WehoSlurry abrasion-resistant piping for transporting slurry and WehoPipe solid-wall pipe for transporting water. Design, jointing and installation of the PE-HD piping systems are also included in the scope of the project. The entire piping system will be finished by the end of 2009 and will be one of KWH Pipe's biggest projects ever.

The project will be described in more detail in upcoming issues of Pipe World.

Located in the municipality of Sotkamo, the mine will provide a lot of employment and, eventually, yield precious metals. Finland's largest known deposit of nickel was discovered there decades ago. The mine is scheduled to begin commercial production in 2009.

Talvivaara Project Ltd is developing a leaching method not seen before in Northern Europe. This method has several benefits: it can profitably extract nickel from ore with a lower concentration of the metal than traditional processes such as autoclave leaching. The process is known as bioheapleaching, where the nickel is separated from the crushed ore using water and bacteria.

For richer ore poorer

The mine is a strip mine in the middle of the forest. The ore found there contains nickel, zinc, copper and cobalt, but it is low-grade ore, meaning that the concentrations of precious metals in it are low.

However, the basic process stages of bioheapleaching – crushing, heaping and leaching – are

relatively cheap, and thus it allows for profitable processing of low-grade ore.

“This method is used a lot in South America, and to some extent in Asia. This project is unique in the Nordic countries, and I am not aware of a similar one elsewhere in Europe either,” says **Lassi Lammassaari**, General Manager, Mine and Infrastructure, of Talvivaara Project Ltd.

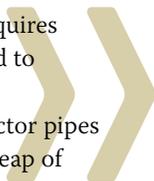
The biggest anticipated uncertainty factor is the effect that the Arctic climate will have on the process. The Nordic weather has been figured into the planning. Encouragingly, the process is already being used successfully at an altitude of 4 km and at below-zero temperatures in Chile.

“In our test area, the heap has retained its heat well, and freezing temperatures will not bring the mine to a halt,” Lammassaari notes.

Make mine KWH Pipe

This environmentally friendly method requires a huge array of pipes for the leaching fluid to circulate.

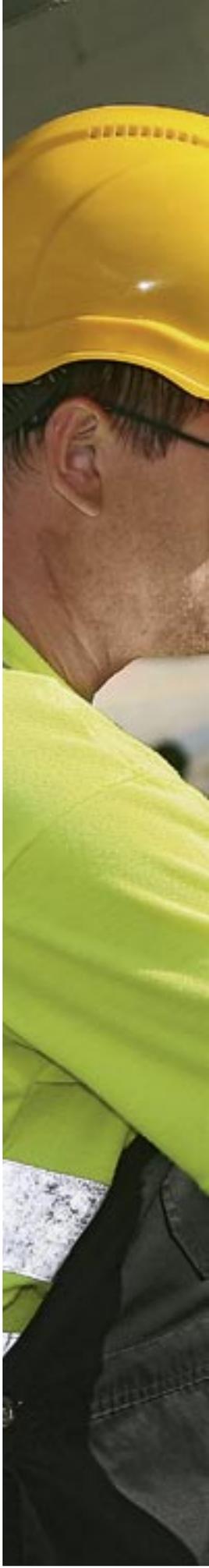
KWH Pipe is currently installing collector pipes which will be buried under the gigantic heap of



One giant heap for minekind:

**EFFICIENT
LEACHING
IN THE TALVIVAARA PROJECT**

The Talvivaara mine project is currently changing a large swathe of remote woodland in Sotkamo, Finland, into a massive construction site. The nickel mine will make use of a leaching method new in Europe, requiring huge lengths of durable piping.





KWH PIPE DOES THE FITTING

The crushed-ore heap at Talvivaara mine will be huge.

It will be a flat-topped heap 800 m across and 2,400 m long. At its maximum, it will contain a mind-boggling 22.5 million tonnes of crushed ore.

“It is a massive project and requires quality that can be relied on from all the materials used. We are delivering pipes, fittings and chambers to the construction site. We have also invested in new welding machines to make the project self-contained,” says Ari Vaarala, Operations Manager at KWH Pipe.

The leaching system requires an unbelievable amount of Weholite pipe and large chambers. The largest pipes are 1,200 mm in diameter, and the majority of the pipes are large in size.

The installations that will be buried beneath the heap are being done with particular care. The high-quality material is handled under controlled conditions throughout the process, from loading at the Vaasa plant to the welding on site.

“Come hell or high water, every step in the process will be carried out with utmost care,” says Vaarala.

“The KWH Pipe installation team has been working on site since mid-August. There are two KWH Pipe fitters there together with excavation contractors, and their supervisor is also from our company,” says Ari Vaarala, noting that KWH Pipe is prepared to commit more staff to the installation work if necessary.



crushed ore to collect the runoff fluid, which is then pumped back to the top of the heap. As the fluid trickles down, it leaches metals from the ore for recovery.

Vesa Ervasti, KWH Pipe's district manager for northern Finland, has been involved in the project for a couple of years.

"Understanding the new leaching method and the process as a whole requires constantly updated expertise and technical know-how. Fortunately, that is what we have," Ervasti says.

The people at Talvivaara have relied on the expertise of KWH Pipe from the very first.

"The sheer amount of piping required for this method is so enormous that when I drew up the

first calculations I thought that I must have misplaced a decimal point somewhere," Ervasti says of the vast scale of the project.

Pipes and the know-how to go with them

According to Lassi Lammasaari, the site places extreme demands on the materials.

"The material requirements for the pipes are strict, because the fluid that runs through them is corrosive. We decided on polyethylene, which is highly acid-resistant. We will need thousands of kilometres of piping all told," he estimates.

Because this is a pioneering project, the demands on project partners are high. Expertise was a defining criterion in the choice of supplier.

"We have had significant input from KWH Pipe experts from the very first," Lammasaari says with satisfaction and notes that it was in fact KWH Pipe which emerged from the competitive tendering as the chosen principal supplier of piping solutions.

25 years in the rock

Building of the actual production heap will begin in July 2008. The mine is expected to be in operation for at least 25 years.

There are other large deposits of low-grade ore in the northern hemisphere, for instance in Russia. The method developed here may be of interest to mining operators elsewhere in the world in the future.

**UNDER-
STANDING
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HOW.**



The Ämmässuo waste treatment centre, owned mainly by the Helsinki Metropolitan Area Council and the City of Espoo, Finland is currently being expanded. The new area features a service tunnel, where a collector pipeline was installed to convey runoff water from the landfill.

ANTISTATIC PIPE TO prevent explosions

Located in Espoo, Ämmässuo is the only waste treatment centre in the entire Helsinki Metropolitan Area, processing the waste generated by more than a million inhabitants and some 50,000 businesses. Mixed waste is dumped in the landfill, and bio-waste is put into the composting plant. A new waste storage area is now being built.

“The first part of the extension will become operational in late November. It is part of a bigger project whose overall timetable has not yet been finalized,” says project manager **Jukka Salmela** of the Helsinki Metropolitan Area Council (YTV).

The principal designer on the project is Ramboll Finland. A 400-metre concrete service tunnel was built leading to the new storage area. Inside it is a collector pipeline to convey runoff water from the landfill which will eventually cover the tunnel. Both ends of the tunnel will be left open.

“Runoff water will be piped into the collector pipeline at intervals of 40 metres. The water is conveyed into a seepage pool, and from there to waste water processing. The pipeline is designed to cope with considerable flow rates, as we are expecting hundreds of thousands of cubic metres of seepage per year,” Salmela explains.

A sealed service tunnel within a landfill is an explosion waiting to happen because of the methane gas generated by the decaying waste.

“All of the structures must be made of materials which conduct electricity. Pipes must be made of steel or a special conductive plastic. A cost comparison showed that plastic was the best choice overall. It was also the safest and the easiest to install,” Salmela summarizes.

It was also important that the pipes could be installed quickly. Rainy weather and water accumulating on the floor of the tunnel would have prevented installation, and equipment and

structures already completed would have been compromised as a result. The collector pipeline is about 400 metres long and consists of four separate pipes, two running on either side of the tunnel. The pipes were joined using electrofusion or butt welding, or in some cases with flange joints.

According to Salmela, the timetable for the installation was tight, but it held. The team of four to five fitters from KWH Pipe finished the job during the summer, by mid-August. The pipeline was installed one pipe at a time.

“Actually, we were ahead of schedule. The work itself took four weeks. We will continue the work after the New Year with the installation of a 250 mm sewer pipe,” says **Ari Vaarala**, Operations Manager at KWH Pipe.

Transporting antistatic pipes requires great care to avoid scratching their surface and thus reducing their conductive properties.

“The pipes must be carried to the site carefully, one at a time, using a forklift truck. We have carried out post-installation measurements on the pipes, and everything is in order,” Vaarala says.

There is a maintenance programme in place for the tunnel.

“The tunnel is air-conditioned, and its quality of air, gas levels and seepage water are constantly monitored. The pipes are also photographed at regular intervals to see if they need cleaning,” Jukka Salmela explains.

Project manager Jukka Salmela of YTV says that the Ämmässuo collector pipeline is unique in Finland. “There will eventually be a layer of landfill on top of the service tunnel, up to 70 metres thick.”



INFO

The Ämmässuo pipelines

- » The pipe system consists of four separate pipelines about 400 m long.
- » The installation used WehoAntistatic triple-layer SDR-17 pipe. Both its inside and outside surfaces are conductive.
- » The pipes used are 160 mm and 315 mm in diameter.



WehoAntistatic is also suitable for locations where there is dry dust, such as mines and wood processing plants.

Energy efficiency IN FOCUS

There is a trend in Russia to minimize heat losses in the district heating systems by replacing old mineral wool insulated district heating pipes with polyurethane-insulated pipes, which conserve energy and last much longer.

As energy prices rise, countries with a cold climate would do well to invest in the quality of district heating pipes and their insulation material to minimize heat loss.

“Under difficult circumstances, during the severest frost, heavily loaded pipes may burst. If a pipeline has a high level of heat loss, the temperature of the water running in it has to be raised to make sure that even the houses at the end of the pipeline are properly heated. Since thermostat systems tend not to work very well either, it is often the case that the first houses along the pipeline take up all the heat and then dissipate it

into the air. Often in winter one can see the snow melting on the ground over the pipes, which is another telltale sign that the heat is not going where it should,” says **Johnny Jakobsen**, project manager at KWH Pipe Technology.

Insulation with a difference

Old district heating systems consist of pipes insulated with mineral or glass wool and installed in a concrete duct. When the wool gets wet, the insulation properties quickly disappear and the pipe starts to corrode fast.

“Environmental values are taken into account in district heating projects these days. Polyurethane-insulated district heating pipes retain heat much better than the old wool-insulated pipes and therefore save energy,” Jakobsen says.

“Installing KWH district heating pipes minimizes heat loss along the pipeline and ensures that there is plenty of capacity to cope with sudden spikes in demand.”

A district heating pipeline boom is taking place in Russia, as a lot of old pipes are being replaced with polyurethane-insulated pipes. However, many of the pipes on the market are handmade and of poor quality, and there are no leak detection mechanisms. As a result, pipes which in other countries would last for 30 to 50 years often fall apart after only a few years in use in Russia.

In building and repairing district heating networks in cities, many Russian energy companies have discovered that manufacturing district heating pipes themselves locally makes much more sense and costs less than outsourcing pipes from an external supplier. To date, nine Russian pipe manufacturers are using KWH Pipe’s production technology.

“KWH Pipe has been manufacturing pre-insulated pipes since 1976 and has supplied production equipment since the late 1980s. Today we are the only supplier on the market who can deliver all of the equipment needed for a district heating pipe production plant. Having a single supplier makes it easier for the customer to manage a plant project. The customer’s personnel are trained in the production process at a KWH Pipe plant in Finland, and the delivery also includes supervision of installation and startup,” explains Jakobsen.

Yury Kabakov, Project Development Manager Tattteploizolyaciya, Jan Finne, Quality Control Supervisor KWH Pipe, Paula Erkoalahti, Sales Engineer KWH Pipe, Ari Hulkkonen, Head Supervisor KWH Pipe, Johnny Jakobsen, Project Manager KWH Pipe at the Kazan plant.





INFO

- » Plant name: Tatteloizolyaciya

- » Product/project: Production facility for pre-insulated pipes

- » Products: Pre-insulated pipes, DN 50–1,200 mm

- » Delivery:
 - Extruder line for 125–560 mm jacket pipes
 - Extruder line for 710–1,200 mm jacket pipes
 - Insulation line for straight pipes
 - Equipment for production of pipe fittings
 - Quality control laboratory
 - Startup and installation supervision



When a customer buys an entire production line the intention is to install the equipment in a factory hall which meets KWH requirements, provided by the customer.

The design and construction or renovation phase lasts about six months. During this time the production equipment is manufactured and transported to the site. Jakobsen says that production can begin within 8 to 10 months of signing the agreement.

New plant in Kazan starts up

The newest district heating pipe production plant using KWH Pipe manufacturing technology started up in Kazan, Tatarstan, the polyethylene capital of Russia, in February 2008. The company is named OOO Tatteloizolyaciya, whose major customer is its parent company OAO Tatenergo, the energy company of the Republic of Tatarstan. The pre-insulated pipes produced at the plant will be used to build new pipelines and to replace the existing district heating network in Tatarstan.

“We chose KWH manufacturing technology because it’s the most modern on the market. The delivery included two extruder lines for PE jacket pipes with diameters of 125 to 560 mm and 710 to 1,200 mm, sandblasting equipment, a foaming table and two high-pressure foam injection machines, equipment for manufacturing pipe fittings, and equipment for manufacturing galvanized-steel pipes,” says **Yuri Kabakov**, Project Development Manager at Tatteloizolyaciya.

“The project began with us conducting a survey of the manufacturers of the equipment we needed. We sent them a request for tender and selected the supplier on the basis of the tenders received. After agreeing on funding with Russian banks, we worked with KWH to plan the technical project regarding equipment placement and made the necessary alterations to the production plant. The equipment was delivered, and KWH experts helped us install it, test it and start it up,” Kabakov explains.

“Delivery and startup progressed on schedule, and we now have three months’ experience in using the production lines. We have made final tuning and adjustments to the system in cooperation with KWH.”

The new equipment, when fully operational, will require 125 new employees to operate it, according to Kabakov. At the moment, the company is negotiating for delivery of a new production line for pressure pipes.



Weholite, KWH Pipe's structured wall piping system, is easy to install on the sea floor even when the diameter exceeds two metres; the pipeline can be completely welded together on land and anchored to the sea floor without expensive external weights, since its hollow profile wall can be filled with cement mortar to weight it down.

Polyethylene REPLACES CONCRETE

Polyethylene pipes replace concrete in power station's cooling water intake.

Alstom has now used polyethylene piping instead of concrete in a power station's cooling water intake for the first time. The advantages of polyethylene piping are that it is easy to install on the sea floor and has a life expectancy of at least 50 years in salt water compared to about 25 years for certain concrete pipes. The gas-powered combined cycle power plant was built in Fos-sur-Mer in southern France for CyCoFos, a power company that is a subsidiary of Gaz de France.

The pipe used was Weholite, one of the few polyethylene pipes in the world that can be made in dimensions of more than two metres. What makes the pipe unique is that it has a hollow profile wall that can be filled with concrete to weight it down. The piping is practically maintenance-free since all joints are welded and polyethylene does not corrode in salt water.

These qualities were factors behind the decision to bring the cooling water into the power station through polyethylene pipelines instead of using pipes of less advanced materials.

"Normally, external weights are used to weigh

down polyethylene pipes, but it isn't practical when we're talking about pipes with diameters of two to three metres that are going to be buried under the sea floor for safety reasons," says **Christian Vestman**, Project Manager at KWH Pipe. "By using non-hardening cement mortar, the pipe retains its built-in flexibility, which means it can withstand different load situations on the sea floor better than rigid pipes."

Stephane Delaplace, who works for Alstom's subcontractor Entreprise Jean Negri & Fils, says it was no trouble to install the polyethylene piping:

"The job involved four parallel pipe sections of about 70 meters each. The piping was welded together in advance on land and transported as a whole to the installation location. They were then filled with water and sunk into the pre-dredged channels on the sea floor. Finally, the piping was covered with sand and rocks so the sea floor looked natural again."

"The actual underwater work took less than a day per pipeline," says Delaplace. "There is no risk of leakage in the piping, which is a risk with sleeve couplings."

FRESH WATER

for generations to come

Since October 2007, Glasgow has been enjoying fresher water than ever from Scottish Water's new water treatment works at Milngavie.

The different treatment areas are connected by a pipework consisting of large diameter polyethylene pipes supplied by KWH Pipe and installed in co-operation with Black & Veatch, the main contractor.

"This was the first time large diameter PE pipes were used on such a large scale," says **Gus Conejo-Watt**, capital investment delivery manager at Scottish Water, which is the fourth largest water and wastewater services provider in the UK. "I think, however, this will change now, as the Katrine project was very successful."

"In order to protect the 150 year old listed causeway and other reservoir structures, Scottish Water, Black & Veatch and KWH Pipe came up with a scheme of laying the large diameter water supply pipes across the bed of the reservoir," says Conejo-Watt. "All parties involved were pleased with the solution, which reduced the risk of damage to the historic structures."

The WTW was delivered more than two months ahead of schedule. The PE pipes delivered to the Glasgow project were of non-standard lengths of up to 14.5 metres that were welded together on-site.

"One of the reasons that we, as a fairly small player in the UK, won this prestigious project, was our ability to deliver long pipes that significantly reduced the pipework installation time," says **George Merry**, Managing Director of KWH Pipe (UK) Ltd.

In addition to the time-saving factor, the company's competitiveness was also boosted by its solid knowledge of welding polyethylene pipes and 25 years of experience in marine installations. "The butt-fusion welding itself was done by A.G. Wilson,

a specialist welding contractor, using a KWH 1,200 mm butt-fusion machine."

The next flagship project for Scottish Water will be replacing Edinburgh's ageing water treatment facilities with a new water treatment plant at Glencourse, just outside the city limits.

"It is the largest single project of its kind in our current investment program. In the tendering process, Black & Veatch offered the best mix of quality and cost. The bonus for us was that the Edinburgh project will have the same team that successfully managed the Katrine Project," says Conejo-Watt.

The plan should be approved by the summer of 2008, and the plant is scheduled to be completed by November 2010. Due to its high profile, it is a very prestigious project for both KWH Pipe and Black & Veatch.

"Installing pipework in the countryside as invisibly as possible is very demanding," says **Bryan Mackie**, Project Manager at Black & Veatch. "The big advantage with PE pipes is that they are flexible to install and that there is virtually no risk for leakage."

One particular aspect of the project is that the approximately 15 kilometres of piping will be produced on-site using KWH Pipe's mobile plant.

"This will save a lot of energy, as the need for heavy traffic on the building site will be minimised," says Mackie. "The mobile plant also enables us to minimize welding by producing longer pipes than usual, which makes installation even easier than in the Glasgow project."

"It really simplifies the installation process on the whole and results in an extremely competitive overall installed cost," says Merry. "With fewer welding points, the risk for leakage is also much less."

THE PROJECT RECEIVED THE PRESTIGIOUS CAPITAL PROJECT MANAGEMENT AWARD IN DECEMBER 2007. AMONG OTHER THINGS, THE JUDGES WERE IMPRESSED BY THE INNOVATIVE NATURE OF THE PROJECT.

When 'new' materials have not been in existence long enough to demonstrate their longevity in the field, producers need to use other means to reassure specifiers about the design life of the materials they choose for infrastructure solutions. Here, plastics specialist Dr Vasilios Samaras explains how he can demonstrate the 100-year-plus design life of high-density polyethylene.

High density staying power

Dr Vasilios Samaras is a technical engineer at Asset International Limited, specialists in water management.

Over the centuries, mankind has worked hard to develop synthetic materials that offer benefits not found in natural products.

The first ever synthetic plastic was cellulose nitrate, discovered in the mid-19th century. Plastics began to be developed in earnest in the 1920s and were used extensively by the military during the Second World War.

Nowadays, plastics are found everywhere in society and are often used to replace traditional materials such as wood, stone or metal.

Of all plastic materials, high-density polyethylene (PE-HD) shows the most robust growth in usage, especially in the pipe industry. In Europe alone, approximately 1.3 million tonnes of PE-HD was processed into pipes in 2007.

In general terms, PE-HD pipes provide designers, developers and contractors with a reliable, durable and cost-effective solution for a wide range of applications including gas, municipal, industrial, storm water attenuation, mining, landfill and electrical and communications duct applications.

PE-HD pipes are also effective for above-ground, trenchless, floating and marine installations. In addition to the operational advantages offered, there are many cost benefits, including low maintenance and ease of installation, compared to traditional materials. This combination of assets has made plastic pipe a very competitive product.

A question often raised, especially by traditional pipe manufacturers, is: "How can you prove a

lifespan of 100 years for PE-HD pipes when they have only been in existence since the 1950s?"

One wonders why this should be raised at all, given that in this age of 'green' awareness environmental experts quite confidently predict that plastic carrier bags will not degrade for up to 300 years. In the case of carrier bags this is an environmental negative, but in the context of piping it becomes a positive.

However, the longevity of PE-HD pipes can actually be proven through scientific research. Only two years after Prof. **Karl Ziegler** succeeded in polymerising ethylene in the presence of organometallic catalyst blends under 'mild' pressure and temperature conditions, the first regular PE-HD production plant, with a capacity of 200 tonnes per month, was already in service.

For this discovery Karl Ziegler, together with the Italian chemist **Giulio Natta**, was awarded the Nobel Prize for Chemistry in 1963.

It was the beginning of a very successful story: by 1962, the worldwide production of PE-HD had already reached 200,000 tonnes. Today, the quantity of PE-HD produced worldwide every year is estimated at 35 million tonnes (2007; all polymerizing processes). By 2010, this figure is predicted to reach 40 million tonnes, of which approximately 4 million tonnes will be processed into pipes.

The first PE-HD pipes had to compete against traditional materials which had a track record with water supply companies, which needed pipe systems with a minimum service life of 50 years.

As **Ulrich Schulte** states in his inspirational work 'A vision becomes true – 50 years of pipe made of HDPE': "Creep tests on HDPE pipes were begun as early as the middle of 1954. Dr. **Kurt Richard**, the then Head of the Materials Department at Hoechst, adapted to plastic the existing method of predicting the service life of high-temperature steels. He applied the Larson-Miller correlation to the stress characteristics of HDPE. In 1959, after only 4.5 years of testing at 80 °C, extrapolation of the time-to-failure values already permitted a prediction of the service life of the tested pipes to be 50 years at 20 °C."

"Two pipe specimens installed in October 1956 are still undergoing creep tests at a temperature of 20 °C and under hoop stresses of 5 and 7.5 N/mm², respectively. On 18 October 2006, the extrapolations of the pioneers of pipe life prediction were finally and most impressively confirmed!"

"The findings obtained in this concrete case of application are of fundamental importance, as the very same extrapolation method is used for predicting the service life of today's generation of PE-HD pipe materials."

This work demonstrates that the minimum service life of PE-HD is 50 years. The success of the global use of PE-HD pipes led to a significant improvement of calibration and extrusion equipment but most importantly to the improvement of PE-HD pipe materials.

The first PE-HD pipes installed in Germany were made from 'first-generation' material. Nowadays we are using fourth-generation materials, resulting in a considerable improvement in the design life.

The design life of pipes manufactured from high performance materials is well above 100 years. It is also important to emphasize the considerable development of additives, such as new types of carbon black, as well as the new generation of antioxidants that further improve the final quality of the pipe. Of course, we should not neglect the fact that first-generation PE-HD pipes installed over 50 years ago are still in use without any signs of fatigue.

Ulrich Schulte refers to an example of first-generation pipes installed in 1961 that were dismantled for testing in 2002. The pipe system had been used for the supply of fresh water. It could be assumed that the pipes had provided a continuous flow of oxygen-saturated water for over 40 years.

Some of the pipes were removed from the building and subjected to tests by an independent test institute in order to establish the residual life expectancy. The results were impressive, indicating

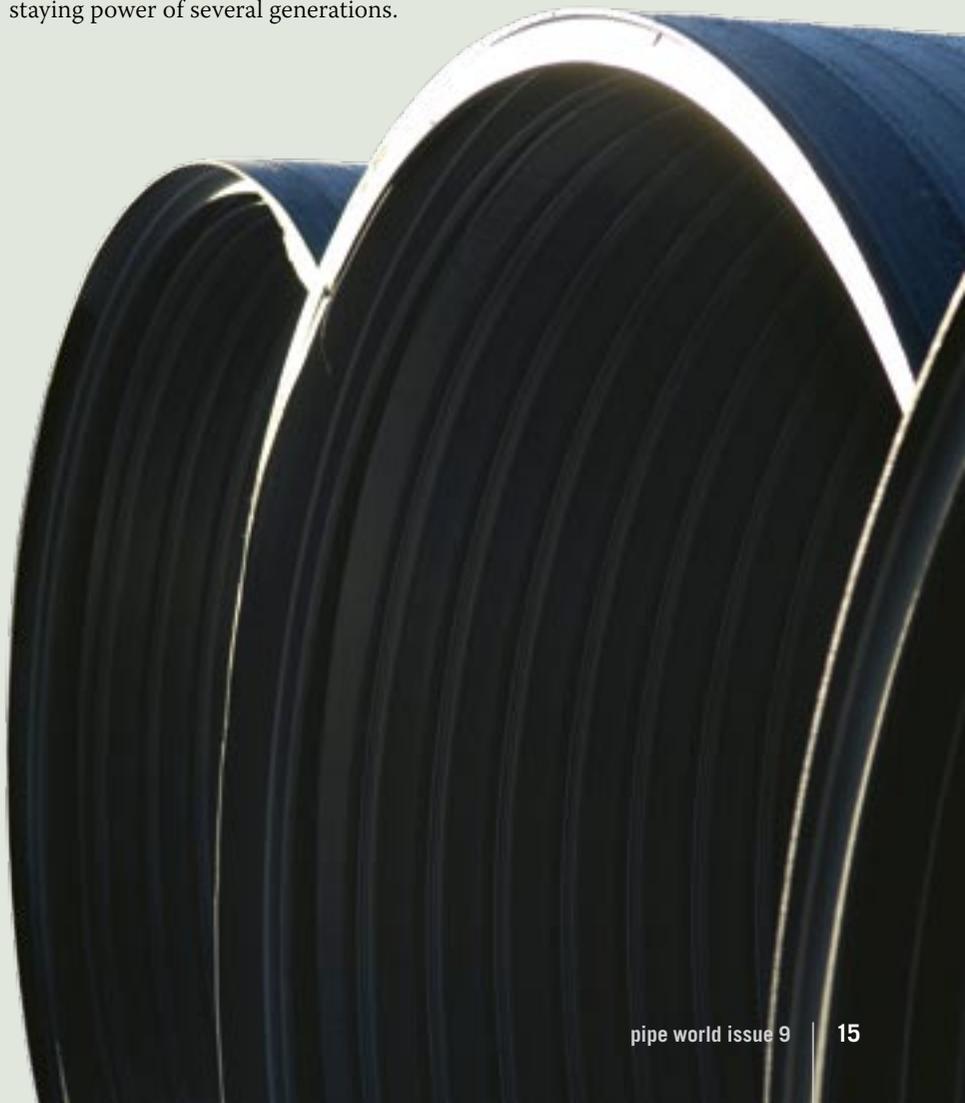
a value of at least 27 years. This clearly shows that the pipes would have by far exceeded the expected service life of 50 years.

There is a wide range of articles referring to tests that evaluate the design life of PE-HD pipes. Dr. **Lars-Eric Janson** has published many articles about PE-HD pipe tests. In his tests, one pipe was compressed to 5% vertical deflection between parallel plates and held, in some cases, for nine years. The stiffness regression recorded directly relates to the relaxation of the modulus of elasticity.

In another series of tests, pipe was deflected to 4.3% and 13.6% and held for eight years, with the same regression being recorded on a log scale. The regression curves can be projected to 100 years, which is slightly more than one order of magnitude over the period tested.

Furthermore, Dr. Janson found that PE pipe tests conducted for as little as 100 hours were sufficient for safe extrapolations of up to 50 years or more.

As the years pass, we will see examples of how PE-HD pipe has withstood the test of time. Meanwhile, designers and specifiers can enjoy peace of mind, knowing rigorous scientific testing to have shown without doubt that this material has the staying power of several generations.



Piping in **THE COLD** *in the Emirates*

Economic growth in the Middle East, India, China and Russia involves increased infrastructure engineering. Growth prompts the need for efficient energy transfer. KWH Pipe Technology can deliver a complete production line for manufacturing pre-insulated pipes in an environmentally friendly way.

In countries with a hot climate, pre-insulated pipes are mainly used to transport cold water for cooling indoor spaces, but they can also be used to convey cold drinking water. In countries with a cold climate, by contrast, the same production technology can be used to produce pre-insulated pipes for heat transfer.

KWH Pipe is actively involved in the pipe market all around the world, having gone international as far back as the 1960s. The company's encouraging experiences worldwide inspire continuing development of new products and production models.

Today, KWH Pipe Technology is the only supplier that can deliver an entire production line for pre-insulated pipes, with all components ready for installation.

"This technology enables environmentally

friendly manufacture of pre-insulated pipes at sizes which the customer needs," says **Risto Ojala**, an expert with KWH Pipe Technology. He is working on the EPPI (Emirates Pre-insulated Pipes Industries) project in Abu Dhabi in the United Arab Emirates.

"The pre-insulated pipes are very versatile. They are mainly used to convey cold water to cool indoor spaces, but they can also be used for conveying cold drinking water," Ojala says.

Cooling and air conditioning using district cooling reduces the need for individual, property-specific systems and improves efficiency and convenience as cooling can be centrally managed.

At the same time, it eliminates the noise and vibrations from property-specific cooling and air conditioning systems, improving housing comfort. Systems serving several buildings are expected to become more common in the future.

"KWH was very convincing"

Many companies are interested in production lines for pre-insulated pipes.

"Major buyers include industrial companies specializing in heat insulation and air conditioning, and material suppliers for the petrochemical industry," Risto Ojala says.

Ghassan Sahli, General Manager of Emirates Pre-insulated Pipes Industries, says that their smooth cooperation with KWH Pipe Technology is mainly due to the supplier offering a first-rate technological solution to its customer.



INFO

Project name: EPPI

- » Plant name:
Emirates Pre-insulated Pipes Industries
- » Product:
Production line for Flexible PU insulated Pipes for district cooling
- » Range of products
DN 16–110
(Carrier Pipe)
- » Scope of delivery:
Complete production line including:
 - extruder line for carrier pipe
 - PU insulation line
 - PE coating line
 - Customized pipe winding units
- » Commercial production started
March 2008



The production line delivered is used for producing windable polyurethane-insulated pipe for district cooling. The pipe can be wound on a reel just like electrical cable, with up to 1,500 metres of pipe fitting onto a single reel.



“No other company was capable of offering anything similar,” Sahli says.

Ghassan Sahli’s company began to import pre-insulated pipes from Europe six years ago. They became acquainted with the market and developed an interest in the business.

The next step was to go into production locally. They contacted several suppliers of machinery and technology. KWH was the most convincing. The Finnish supplier was quick to deliver a production line, which was also promptly set up for commercial production.

“The KWH Pipe production model, where the inner and outer layers of a pipe are manufactured simultaneously, makes it clearly better than the other products,” says Ghassan Sahli.

The EPPI project is currently producing pre-insulated pipes in reels of 100 to 300 metres. They vary in diameter from 16 to 110 mm.

Environmentally friendly products

The EPPI project production lines comply with environmental values. Centralized district cooling is more efficient than cooling each home or each building separately.

“This technology also renders obsolete the ozone-depleting refrigeration equipment which still uses CFC, HCFC or HFC. The product in itself contains no environmentally harmful substances,” Risto Ojala asserts.

He explains that it is because of this that starting production does not require a major hassle with permits.

“The product does not burden the environment. Its raw materials only include one component of which the authorities must be notified so that they can inspect its storage arrangements and verify that it is being correctly used,” Ojala says.

Ghassan Sahli also notes that EPPI is an environmentally friendly company.

Ojala explains that financing for a production line is agreed on a “business as usual” basis. A production line is always an investment based on profitability calculations.

Mr. Sahli also points out that the production line has a positive local impact. “We can now produce all of the pipes we need locally, and even the raw materials — high density polyethylene and polyurethane — are produced in our country. The products help convey cold water efficiently, enabling the most pleasant and least energy-consuming way of providing air conditioning available today.”



Northumbrian Water supplies 2.6 million customers in the North East of England with water and wastewater services, trading as Northumbrian Water, and 1.7 million customers in the South East of England with water services, trading as Essex & Suffolk Water. Northumbrian Water is investing to upgrade the North East's vast sewerage network between 2005 and 2010.

FLOOD ALLEVIATION SCHEME
FEATURING **bespoke
solution**



An improvement scheme delivered by Seymour Civil Engineering Contractors Ltd (Seymour) on behalf of Northumbrian Water Limited (NWL) is using an innovative water management solution to reduce the risk of flooding in North Tyneside, UK.

The 12-month flood alleviation project at a residential development in the village of Shiremoor will feature a bespoke solution manufactured by Asset International Limited, KWH Pipe's Weholite licensee in the UK. The low pressure – high technology pipe offers the construction and water industries a low overall cost solution across a range of applications, including surface drainage, foul sewers, inter-process pipe work, culverts, attenuation tanks, ducting and outfalls and is recognized as a lightweight, durable, easy-to-install and abrasion-resistant product tolerant of ground movements.

Following periods of extreme rainfall in 2005, extensive property and curtilage flooding occurred on three occasions at a housing development, Park Estate, on the outskirts of the village.

Almost 150 homes on the estate were affected by the flooding; in February 2006, NWL added the houses to the DG5 At-Risk Registers created by the Water Services Regulation Authority (OFWAT) in September 1989 to catalogue all UK properties estimated to flood more than once in ten years.

Ian Davison, Project Manager for NWL, explained how Park Estate was considered a priority area for flood alleviation work. He said: "Removing properties in the area we serve from the DG5 At-Risk Register by sourcing and using sustainable solutions to combat flooding has been one of our key priorities in the wake of such adverse weather conditions."

"There are many homes estimated to be situated in areas of high flooding risk in the county, and researching all possible options before we deliver a flood alleviation scheme is essential if we are to find a long-term solution."

Design consultants Mott MacDonald Ltd (Mott MacDonald) presented 14 possible design options to NWL. The innovative high-density polyethylene pipe, Weholite, offered by Asset was

THE WATER WILL BE STORED AND GRADUALLY RELEASED INTO THE EXISTING SEWER SYSTEM DOWNSTREAM.



All 15 parallel Weholite pipe runs, each measuring 2,100 mm in diameter and 114 m in length, are installed. The Weholite solution is backfilled by Seymour Civil Engineering Contractors Ltd.

deemed the most suitable solution for this specific project.

Mr Davison added: "This is the first time Northumbrian Water has used Weholite in one of our flood alleviation schemes, and we have calculated significant benefits in using this innovative solution, including potential time and cost savings."

Mott MacDonald worked in collaboration with Asset on behalf of NWL to design a unique tank system consisting of 15 parallel pipe runs. Each pipe measures 2,100 mm in diameter and 114 m in length. In addition, several existing sewers were increased in size and re-directed into the new Weholite tank system, which has a capacity of 6,000 cubic metres.

Upon project completion, rainwater will enter the tank system via a large inlet manifold. The water will then be stored in the tank and gradually released through a smaller outlet manifold into the existing sewer system downstream.

David Holloway, Site Agent for Seymour, commented on the ease of installation using Weholite. He said: "Compared with other projects we have worked on, Weholite proved very efficient in terms of reducing the project delivery time, which is an important factor in ensuring that a scheme involving numerous partners is delivered within the agreed time-frame."

"Asset manufactured and later delivered the pipes to the site, which caused less disruption to the surrounding communities and also reduced the amount of time spent in the ground by workers during the installation process. This ultimately decreased health and safety risks for all."

Simon Thomas, Managing Director of Asset, based in Newport in South Wales, commented: "With the recent flooding crisis at the top of the public agenda, this scheme demonstrates how an innovative and bespoke design can provide a long-term solution to water infrastructure issues."

"We are delighted to have been given the opportunity to act as the partner of choice in this project and hope to work with NWL on other similar schemes in the future."



Weholite stormwater system helps preserve one of earth's natural resources

With climate change and the environment factoring as priorities on a worldwide basis, Weholite is a prime example of a down-to-earth solution.

The York Region School for Athletics together with the Toronto Regional Conservation Authority (TRCA) needed to move forward with a solution for water control and irrigation, while at the same time demonstrating a firm commitment to the local environment.

The project is situated close to a major watershed area servicing the greater Toronto area. Like many rivers and streams in the region, signs of extreme environmental stress are evident, and the TRCA raised concerns about the impact of potential contaminants being washed off this site and into the nearby river. By harvesting and reusing the rainwater, in

this case for irrigation, the owner wanted the project to be recognized as a LEED (Leadership in Energy and Environmental Design) project, demonstrating energy efficiency and environmental protection.

The naturally high ground water table on this site posed a design and construction challenge for the massive rainwater storage tank.

The original design for this project involved an array of 36" (914 mm) diameter double-wall pipe to be installed under the sports field itself to store rainwater. The rainwater was to be collected by a network of small-diameter perforated pipes just under the finished grade, and the ground water was to be lowered by a network of

small-diameter perforated pipes below the storage pipes. Distributor Terrafix® Geosynthetics Inc., in conjunction with KWH Pipe, provided the owners, engineers, architects and the contractor with a detailed proposal to replace the three layers of pipes with a single large tank of equivalent volume storage capacity.

The redesign took into account the buoyancy uplift resulting from the high ground water table and the redesign of the associated piping system and pumps required.

A "green" solution and a wise use of natural rainfall

Lightweight, leak-free Weholite was ideal for this project. Approximately 600 feet (183 m) of 120" (3,000 mm) RSC250 was customized for the project. The piping was fabricated, shipped and installed with minimal environmental impact on the site.

The tank sections were installed in granular bedding and assembled using a leak-free joining method. The lightweight properties of Weholite enabled the contractor to handle and place each tank section quickly and easily, using lifting equipment commonly found at most construction sites. Each of the 120" (3,000 mm) DN/ID Weholite sections weighed approximately 13,000 lbs (5,900 kg) and were assembled to form a single stormwater holding tank capable of storing in excess of 350,000 US gallons (1,325 m³) of rainwater. The result was a cost-efficient solution for the project and a non-invasive application for the environment.

It is easy to foresee future prospects for this type of project. Underground storage tanks mean more land available for construction, which is especially valued in urbanized areas where land is scarce and expensive. With the high level of importance placed on LEED certification for new buildings and building sites, underground storage tanks play an important role. In locations where maintaining the integrity of the environment is crucial, a post-project run-off which is less than pre-development run-off is an important achievement.

With Weholite, KWH Pipe provides environmentally friendly "green" solutions for project owners.

Protection of ELECTRIC CABLES

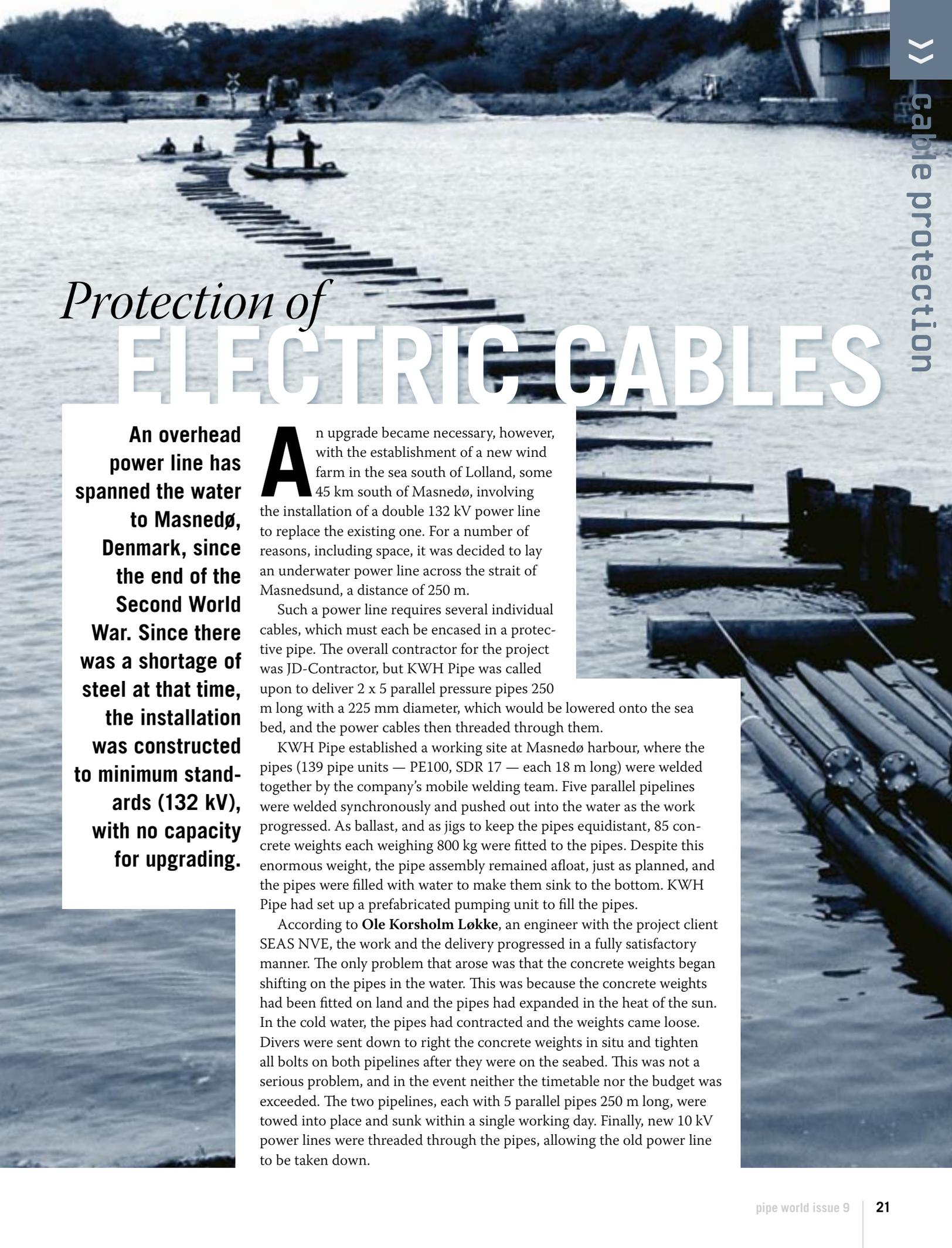
An overhead power line has spanned the water to Masnedø, Denmark, since the end of the Second World War. Since there was a shortage of steel at that time, the installation was constructed to minimum standards (132 kV), with no capacity for upgrading.

An upgrade became necessary, however, with the establishment of a new wind farm in the sea south of Lolland, some 45 km south of Masnedø, involving the installation of a double 132 kV power line to replace the existing one. For a number of reasons, including space, it was decided to lay an underwater power line across the strait of Masnedund, a distance of 250 m.

Such a power line requires several individual cables, which must each be encased in a protective pipe. The overall contractor for the project was JD-Contractor, but KWH Pipe was called upon to deliver 2 x 5 parallel pressure pipes 250 m long with a 225 mm diameter, which would be lowered onto the sea bed, and the power cables then threaded through them.

KWH Pipe established a working site at Masnedø harbour, where the pipes (139 pipe units — PE100, SDR 17 — each 18 m long) were welded together by the company's mobile welding team. Five parallel pipelines were welded synchronously and pushed out into the water as the work progressed. As ballast, and as jigs to keep the pipes equidistant, 85 concrete weights each weighing 800 kg were fitted to the pipes. Despite this enormous weight, the pipe assembly remained afloat, just as planned, and the pipes were filled with water to make them sink to the bottom. KWH Pipe had set up a prefabricated pumping unit to fill the pipes.

According to **Ole Korsholm Løkke**, an engineer with the project client SEAS NVE, the work and the delivery progressed in a fully satisfactory manner. The only problem that arose was that the concrete weights began shifting on the pipes in the water. This was because the concrete weights had been fitted on land and the pipes had expanded in the heat of the sun. In the cold water, the pipes had contracted and the weights came loose. Divers were sent down to right the concrete weights in situ and tighten all bolts on both pipelines after they were on the seabed. This was not a serious problem, and in the event neither the timetable nor the budget was exceeded. The two pipelines, each with 5 parallel pipes 250 m long, were towed into place and sunk within a single working day. Finally, new 10 kV power lines were threaded through the pipes, allowing the old power line to be taken down.





The massive construction site of the Vuosaari cargo harbour in Helsinki, Finland has hundreds of contractors working around the clock.

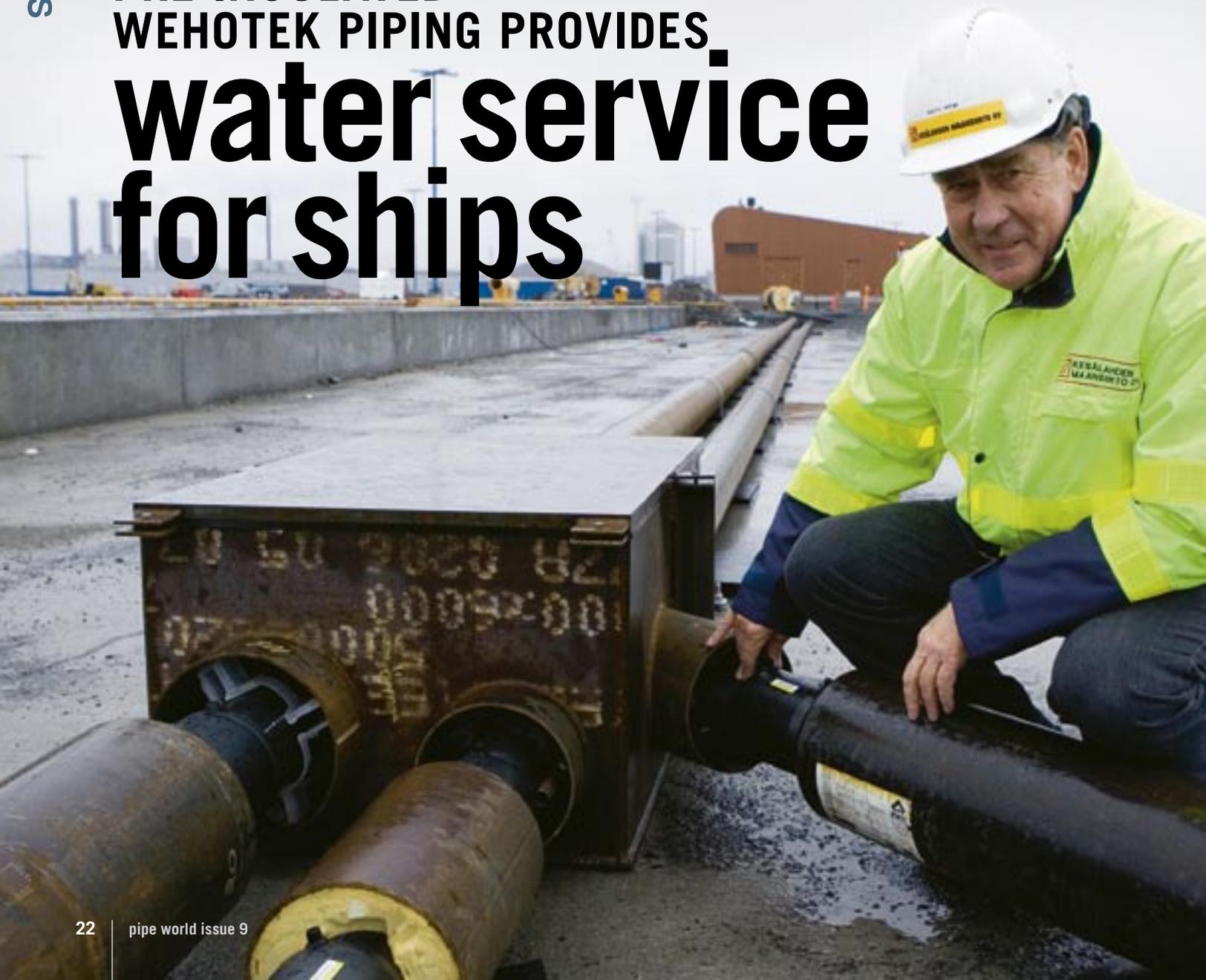
Kesälähden Maansiirto Oy, an earth-moving company, has been working in different capacities in the area for several years now and is presently running its third major project: installing pre-insulated water and sewer pipes to be used for emptying and filling the ships' water tanks. The pipes used in the project are supplied by KWH Thermopipe.

In its 40 years of operation, Kesälähden Maansiirto has solidified its standing as one of Finland's top ten earthmoving companies. It has around 100 employees, and its annual turnover is near EUR 30 million. The company specializes in large-scale, demanding earthmoving projects in the building of roads, railways and bridges.

Water-related projects include work on canals, harbours and quays, as well as groundwork for water supply and water treatment facilities. The company has a branch dedicated to construction, working primarily on public utilities, shopping centres and other commercial sites. Kesälähden Maansiirto also engages in joint projects with other organizations. The 100-hectare project at Vuosaari is therefore a natural fit for the company.

Risto Niemi is Kesälähden Maansiirto's Site Manager at Vuosaari. "Our job is to complete all of the work that goes under the asphalt surface: we cast crane support systems and lay pipework, water piping and cable protection piping," he explains.

PRE-INSULATED WEHOTEK PIPING PROVIDES water service for ships



Preparing the ship to sail

The plan for the pipework near the Vuosaari cargo harbour quays landed on Risto Niemi's desk early last year. The water and sewer pipes to be installed are to be used for water services that empty and fill the ships' water tanks. When a ship arrives at the harbour, the ship's wastewater is pumped out and piped to the city wastewater treatment plant. Clean water is then pumped back to the ship for the next journey, leaving it shipshape and ready to go.

"We made our first bid for the project in February 2007. It was checked in September and accepted in December," says Niemi. A contract was drawn up shortly before the New Year, after which the earthmoving company received the project plans. The pipe contractor chosen was KWH Thermopipe, who began manufacture of the pipes forthwith. Actual installation work at the site began in mid-February 2008.

A three-pipe challenge

Pipes installed in the surface of the harbour quays must be pre-insulated and trace heated so the pipe content will not freeze in cold weather. "The pipes are embedded in the quay at a depth of 0.5 m," explains Niemi. The system consists of three pipelines, of which the 140 mm sewer is the largest. The water pipes are 80 and 100 mm in diameter. The pipes are insulated with a 50 to 60 mm layer of polyurethane foam, and the entire assembly is covered with a protective jacket pipe made of steel and polyethylene.

Wehotek pipes are well suited to this kind of project, and a total of 2,200 metres of piping was required. Delivery also included various valves and fittings. "Delivery of material has gone well. There were very few deficiencies, and we were never held up because of deliveries," says Niemi.

Heavy material

Four men began installation work in February and March: two plastic pipe joint welders, one acid-resistant steel pipe welding professional and an installer representing the earthmoving company, responsible for the connections on site.

"Once the installation is in full swing, six to eight installers will be needed. The speed of the material delivery has picked up as planned, and we are increasing our manpower," says Niemi.

The pipes are installed in two different ways. Some of the pipes are installed in the quay jetty, on top of the concrete slab in the sea. The other pipes will be attached to the retaining wall quay, against the ground. In the latter case, the trunk pipeline will be installed in the ground and its branches will



Pre-insulated Wehotek piping provides water service for ships at Vuosaari Harbour in Helsinki.



continue on into the tunnel. Installation demands a lot of practical experience. The pipe elements with carrier pipes, insulation and steel jacket pipes are 12 m long and heavy to move.

"They must always be moved with machinery. You cannot move heavy pipes like this by hand. But in other respects, the work is standard installation: welding plastic and steel pipes," says Niemi.

Installation has been successful because the material is familiar. Niemi notes that handling heavy material requires an expertise of its own, but once you know what you are doing, the work flows smoothly. The pipes, drains and equipment installed here need to withstand the great traffic loads in the harbour area. "Because the pipes will be in the quay at a depth of 0.5 m, they will need to be able to withstand the weight of the heavy lorries and loaders," says Niemi.

On top of the game technically, working together

The earthmoving company planned the pipe project together with KWH Thermopipe. "We received valued technical assistance. We held several meetings, and the wishes of the electrical contractors were also taken into consideration. Installation of the trace heater cables in the pipes will be handled flexibly," Niemi comments. Pipe installation at Vuosaari Harbour will continue through the spring and into the summer. The project will be completed by the end of July 2008.



Vuosaari Harbour

- » Vuosaari Harbour will comprise the gate area, the enclosed harbour area, the adjacent Harbour Business Park and the Meriportti Business Park.
- » The project is being conducted by the Port of Helsinki, in cooperation with the Finnish Maritime Administration, the Finnish Rail Administration and the Finnish Road Administration.
- » The cornerstone was laid on 7 January 2003, and the harbour will begin operation at the end of 2008.



PE and PP welding machines from KWH Tech

The products and services of KWH Pipe Technology and its subsidiary KWH Tech GmbH complement KWH Pipe Group's core operations and support big pipe projects worldwide.

The standard range of products includes manual and semi-automatic butt fusion welding equipment (20 – 1600 mm) for on-site use and for the production of fittings in the workshop, band saws and apparatus for the supervision of welding quality and the control of welding parameters.

Since the 1960s, KWH has delivered thousands of welding and special machines to customers all over the world. One of the operating principles is to find strong partners in foreign markets and to create a successful distribution network.



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M e m b e r o f t h e K W H G r o u p