

Programme - Tuesday 4th September - Site Visits

The site visits have a focus on health and safety of personnel and the latest developments in automated jetting equipment. The visits will offer attendees first hand appreciation of both manual and robotic jetting operations. A number of demonstrations will take place during the day with the opportunity to try hand held cleaning for yourself! **Only several places left** - Attendees are advised to dress appropriately for outdoor demonstrations, including steel toe capped boots. Any additional safety equipment will be provided by the hosts.

Morning Site Visit – Jetchem Systems Limited

The Jetchem Group, which consists of six strategically placed nationwide depots under the banner Superjet, are one of the UK's largest manufacturers and suppliers of high and ultra high pressure water jetting machines and ancillary equipment.



With over 25 years of experience in the industry covering all aspects from sales, hire, service and spares to nationwide approved training in water jetting, patch lining and confined spaces. Jetchem pride themselves on delivering a complete package of what is required in today's water jetting and drainage industry.

The visit will consist of;

- Safety training instructors providing an insight into the safe use and also the dangers of working with high pressure water jetting equipment.
- Industry experts explaining the different applications of water jetting equipment, from small pressure washers and drain cleaning units to high and ultra high pressure equipment including vessel cleaning applications.
- Live demonstrations of water jetting equipment at varying ranges of pressures. Providing an opportunity for attendees to “have a go” with a variety of equipment to experience the reactive forces involved and explaining methods on how to eliminate fatigue for the end user.
- Live demonstrations on various lining techniques, conducted by Re-Tec, the lining specialists. In particular demonstrating the process of patch lining from locating the damaged area, equipment available and the installation process. General overview on how to repair pipelines without the need for excavation and outlining the equipment available.
- Stand showcasing a range of jetting equipment and accessories which also includes Ridged Tools hand held inspection systems, representatives of which will also be on hand to provide demonstrations.

Agenda

08:50	Coach pick up from Hotel Football
09:30	Arrive at Jetchem Systems Limited
09:45	Meet and greet (teas and coffees)
10:00	Welcome <ul style="list-style-type: none"> • Site safety talk • Company introduction • Outline of the mornings events • Split delegates into groups • Distribute safety equipment
10:30	Group visit each interactive stands <ul style="list-style-type: none"> • Jetchem - Drain cleaning techniques • Re-Tec - Lining demonstrations • Ridged Tools - inspection equipment demonstrations • UHP and hydroblasting - demonstration
11:45	Tea and coffee, thank you and gift bag
11:55	Coach transfer to Falch

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Afternoon Site Visit – Falch

Falch has over 200 employees with only one target: to build the best water jetting machines of the world!



“We have 31 years experience in manufacturing professional water jetting machines. Our facilities include brand new development centre for machines, accessories, pumps and robots with all our products made in Germany at our modern 23,000 m² factory. 500 new and used water jetting machines are available ex works 100 rental, sales and service points in Europe”.

Over the years Falch has been working on numerous innovations, technology and working processes. This has brought the company a great deal of success and also success for its customers. In addition to the practical competence, there are other aspects that are very close to our heart. This includes: the positive and appreciative handling of human resources, customers, employees and suppliers both in front and behind the scenes.

Competence for Water Jetting

Here at Falch our objective is to make the machines work faster and better, more economical and more environmentally friendly. This is done through applying the whole of our energy resources day by day in order to achieve customer satisfaction.

Who else can offer this?

It is not enough for us to simply sell you a product and then wish you success with it. Our aim is to have a long term partnership with you, the customer. However, we can only do this due to our employees continuously working directly to produce improvements.

What to expect?

Our staff here in the UK invite you to visit us to see the latest developments in automated solutions within water jetting. We will show you how you can both reduce operational costs and improve safety with new innovations brought to the market by Falch as well as gain some hands on experience with our equipment.

Agenda

12:20	Arrive at Falch	
12:30	Introductions Light sandwich lunch Split delegates in to 2 groups	
13:00	Group 1 - Classroom <ul style="list-style-type: none"> • Introduction to Falch • The innovation process • What's new in the world of Water Jetting • Nozzle technology 	Group 2 - Workshop <ul style="list-style-type: none"> • Introduction to Falch • Introduction to the worlds widest range of Water Jetting machines • See, touch and feel • Multikit (a new approach) • Practical demo on taming and controlling reaction forces for improved safety and profit
14:30	Break and Rotate Groups	
16:15	Coach pick up and return to Hotel Football	

Programme - Wednesday 5th September

08:15 Morning registration at Hotel Football Manchester
Outside the conference room (The Stadium Suite 1)

09:00 Conference Chairman Welcome

Mark Fairhurst, Technical Director, BHR Group

Mark has a 1st Class Honours BSc in Mechanical Engineering – 1980 University of Sussex, UK. A Masters degree in Abrasive Water Jet Cutting from Cranfield Institute of Technology – 1982. He is the inventor of the direct injection method of abrasive jet cutting and presented the first paper on the subject at the 8th water jet conference in 1986. Mark has worked on many aspects of water jetting throughout career, including R&D, hazardous environment cutting both offshore and in petrochemical plants. As a consultant engineer he has also worked on fluid power systems, sealing technology, and all manner of high pressure/high temperature fluid systems in safety critical applications. Over past year Mark has been working on specialised AWJ solutions for both nuclear and oil/gas applications. Interests outside work are building traditional V8 hot rods and racing a Chevrolet-powered dragster at National Championship level.



09:15 Opening Keynote Address

Marcel van Wonderen, KLM Royal Dutch Airlines, The Netherlands

Working for KLM Royal Dutch Airlines since 1986 at the Process Equipment & Materials Development Department as Master Engineer. Responsible for special processes in the aircraft MRO-business with regard to: specifications, innovations, process-improvement & optimization, trouble shooting, manuals, equivalencies, audits and setting up/performing theoretical/practical training courses. The above taking in account national and international aircraft regulations and environmental/occupational health legislation. Responsible, among other things, for consultancy on air filtration systems, robotics, shotpeening, waterjetting, gritblasting and thermal spraying in the Aircraft-MRO business.



Presentation title: Aircraft Engine MRO - Special Repair Techniques (including waterjetting)

09:45 Session 1 - Cleaning and Surface Preparation
Chairman: Marcel van Wonderen, KLM Royal Dutch Airlines, The Netherlands

09:45 Forced pulsed waterjet peening potential of VAR 300M steel for aerospace applications in comparison to conventional glass bead peening

A Nastic, M Yandouzi, B Jodoin, University of Ottawa, Canada; A Tieu, M Vijay, VLN Advance Technologies Inc., Canada

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10:15 Integration of jetting technology in metal additive manufacturing

R Pahuja, M Ramulu, University of Washington, USA; M Hashish, Flow International Corporation, USA

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10:45 New metal surface produced by ultra-high-temperature and pressure cavitation

T Yoshimura, M Ijiri, D Shimonishi, K Tanaka, Sanyo-Onoda City University, Japan

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11:15 Exhibitors Presentation



11:20 Exhibitors Presentation



Programme - Wednesday 5th September

11:25 **Networking Refreshment Break with the exhibitors in The Stadium Suite 2**

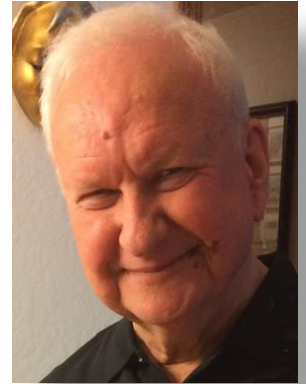
11:55 **Session 2 – Emergency Services**

Chairman: Dr Axel Henning, OMAX Corporation, USA

11:55 **Keynote Address**

Professor Emeritus David A Summers, Curators' Professor of Mining Emeritus, Missouri University of Science and Technology, USA

Dr Summers was, for 42 years, the Head of the Waterjet Laboratory at MS&T overseeing research into the broad field of waterjet use as it changed from a laboratory curiosity into a broadly used tool. Their work helped develop many of the applications for this tool, and defined the parameters for its more effective use. Beginning with applications in mining, the group went on to study waterjet use in cleaning surfaces, cutting different materials, and a number of military applications including ways of dealing with devices containing explosive materials. Dr Summers and his group have received international recognition of their work, including a citation for one of Time magazines Inventions of the Year. Since his retirement he has remained active in the field writing articles on the history of the technology (previously producing the 900 page book "Waterjetting Technology") are actively consulting in the field.



Presentation title: Waterjets in an age of insecurity

12:25 **Technical countermeasures research on deep sea shipwreck water cutting engineering**

S Xue, Z Chen, Q Ren, Y Wang, S Cao, C Han, D Zhang, Hefei General Machinery Research Institute, China

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12:55 **Exhibitors Presentation**



13:00 **Exhibitors Presentation**



13:05 **Lunch Break – Kindly sponsored by Flow in the Players Lounge**

14:05 **Session 3 – Fundamentals – Part 1**

Chairman: David Kennedy, The Water Jetting Association, UK

14:05 **Periodical shedding of cavitation cloud induced by a cavitating jet**

H Kamisaka, Sugino Machine Limited, Japan; H Soyama, Tohoku University, Japan

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14:35 **Flow characteristics of air-ventilated water jets under submerged condition**

G Peng, Y Oguma, S Shimizu, Nihon University, Japan

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15:05 **Exhibitors Presentation**



15:10 **Exhibitors Presentation**



15:15 **Networking Refreshment Break with the exhibitors**

Programme - Wednesday 5th September

15:45 Session 4 – Equipment

Chairman: Franz Trieb, BFT GmbH, Austria

15:45 **Development of water-jet nozzle for ultra-high temperature and pressure cavitation** 61
T Yoshimura, M Ijiri, D Shimonishi, K Tanaka, Sanyo-Onoda City University, Japan

16:15 **New applications for personal abrasive waterjets**
A Henning, B Gugliemetti, OMAX Corporation; USA

16:45 **AWJ cutting heads for special applications**
M Hashish, Flow International Corporation, USA

17:15 Exhibitors Presentation 

17:20 Exhibitors Presentation 
 Best Fluid Technology
 A Member of Dr. Aichhorn Group

18:45 **Coach to the Conference dinner – The Living Room**

Dinner drinks kindly sponsored by;



Presentation of the best paper award,
 kindly sponsored by;



22:00 Coach depart for Hotel Football

Dress Code:
Smart/casual

Provisional Programme – Thursday 6th September

09:00 Session 5 – Fundamentals – Part 2

Chairman: Professor Vanessa Cutler, Consultant, UK

09:00 **Abrasive waterjet process monitoring through acoustic and vibration signals** 75
R Pahuja, M Ramulu, University of Washington, USA

09:30 **Effects of particle fragmentation on performance of the abrasive waterjet** 89
A Henning, P Miles, E Schubert, OMAX Corporation, USA

10:00 Exhibitors Presentation 

10:10 **Networking Refreshment Break with the exhibitors**

Programme – Thursday 6th September

10:40 Session 6 – Machining, Part 1

Chairman: Mr Alex Jenkins, Sellafield, UK

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|-------|--|-----|
| 10:40 | Recent advancement in abrasive waterjet for precision multimode machining
(Peter) H-T Liu, N Webers, OMAX Corporation, USA; V Cutler, Independent Waterjet Specialist and Glass Artist, UK | 189 |
| 11:10 | High-pressure jet cutting with liquid CO2 of plastics
<i>E Uhlmann, P John, Technische Universität Berlin, Germany</i> | 167 |
| 11:40 | Effects of abrasive waterjet trepanning on the kerf formation
<i>E Uhlmann, C Männel, Technische Universität Berlin, Germany</i> | 155 |
| 12:10 | 3D measurements of abrasive waterjet cut surfaces
<i>P Miles, A Henning, OMAX Corporation, USA</i> | 127 |

12:40 Lunch

13:40 Session 7 – Machining – Part 2

Chairman: Mr Alex Jenkins, Sellafield, UK

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|-------|---|-----|
| 13:40 | Micromachining with abrasive waterjets – Intrinsic material properties retrained by nanosecond ablation at MHz frequency
<i>D S Miller, Miller Innovations, UK</i> | 179 |
| 14:10 | Waterjets for aeroengine applications
<i>M Hashish, Flow International Corporation, USA</i> | 207 |
| 14:40 | An experimental investigation of abrasive waterjet milling circular pocket of titanium alloy
<i>T Sun, Y Yu, Y Yuan, X Wang, H Gao, Dalian University of Technology, China; Z Wu, Shenyang APW Technology Co., Ltd, China</i> | 143 |

15:10 Networking Refreshment Break with the exhibitors

15:40 Session 8 – Nuclear Applications

Chairman: Professor Ramulu Mamidala, University of Washington, USA

15:40 Keynote Address

Alex Jenkins, Decontamination Centre of Expertise Lead, Sellafield Limited, UK

Alex is a degree qualified Chemist, Chartered Chemist, Chartered Scientist and a Fellow of the Royal Society of Chemistry in the UK. He has been conducting nuclear decontamination across a range of plants and challenges for over 15 years. As a Water Jetting Association qualified water jetter, he has been conducted numerous water jetting projects at Sellafield, setting the standard for the industry and in doing so, has investigated incidents too. Part of Alex's role includes the development of tools and techniques to support the future needs of the nuclear industry, primarily at Sellafield.

Presentation title: The value of assessing competence, documentation and procedures to improve water jetting safety



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Session 8 – Nuclear Applications, Continued

Chairman: Professor Ramulu Mamidala, University of Washington, USA

16:10	The impact of ultra high pressure water jetting on the near surface microstructure of type 304L stainless steel	243
	<i>I P Nedyalkova, D L Engelberg, The University of Manchester, UK; A Jenkins, Sellafield Ltd, UK; G T W Law, The University of Manchester, UK and The University of Helsinki, Finland</i>	
16:40	AWJ piercing of pressurised nuclear waste canisters	221
	<i>M Fairhurst, BHR Group, UK</i>	
17:10	Multiple applications of water jetting in the nuclear industry	229
	<i>E Ostle, A Jenkins, G Yates, Sellafield Limited, UK</i>	
17:40	Conference Chairman – Conference close	

BHR Group would like to thank the following organisations for their help and support:



Organiser Contact Information:

Ally Lynes
Events Manager
Email: confx2@bhrgroup.co.uk
Phone: +44 (0) 1234 750 422
Website: www.bhrgroup.com/events

BHR Group
The Fluid Engineering Centre
Cranfield, Bedfordshire
MK43 0AJ
United Kingdom



BHR Group - a trading name of VirtualPiE Limited
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Meet your Session Chairman

Session 1 - Cleaning and Surface Preparation

Marcel van Wonderen, Master Engineer, KLM Royal Dutch Airlines, The Netherlands

Working for KLM Royal Dutch Airlines since 1986 at the Process Equipment & Materials Development Department as Master Engineer. Responsible for special processes in the aircraft MRO-business with regard to: specifications, innovations, process-improvement & optimization, trouble shooting, manuals, equivalencies, audits and setting up/performing theoretical/practical training courses. The above taking in account national and international aircraft regulations and environmental/occupational health legislation. Responsible, among other things, for consultancy on air filtration systems, robotics, shotpeening, waterjetting, gritblasting and thermal spraying in the Aircraft-MRO business.



Session 2 – Emergency Services

Dr Axel Henning, Director of Research and Development, OMAX Corporation, USA

Axel has a mechanical Engineering Diploma (Dipl.-Ing.) Degree from Hannover University where he was first introduced to waterjets in 1991. During his graduate studies he worked there under Prof. Hartmut Louis as research assistant and performing thesis work. In 1995 he then became the head of the waterjet laboratory at the University of Stuttgart and in 2001 the head of the research group for flexible manufacturing technologies at the Fraunhofer Gesellschaft. There he performed research and technical consultancy in many fields of manufacturing with an emphasis on waterjet cutting, deburring and additive/rapid manufacturing. He obtained his doctorate (Dr.-Ing.) degree for his research in modelling of the cutting edge of the abrasive waterjet. In 2007 he joined the OMAX Corporation to lead the engineering group for research and development. There he is thriving to maintain the company's dedication to innovative cutting edge technology. Interest outside work includes trail running and hiking in the beautiful Cascadia.



Session 3 – Fundamentals – Part 1

David Kennedy, Director, The Water Jetting Association, UK

David has been Director of the Water Jetting Association since January 2009 – 45 years in the jetting industry – started with Harben Pumps Ltd as a Sales Engineer progressed through to depot management – started up Harben Pumps (London) Ltd (High Pressure & Ultra High Pressure Pump Rental) – moving to Neolith Pumps Ltd (1985) started up Neolith Pumps (London) Ltd (Technical Director) operating a fleet of 85 jetting units including 10 x Vehicle Mounted Jetting Units – highlight of my time with Neolith was building and supplying 5 x 150hp Containerised Silenced Jetting Units (24hr Operation) all connected together to power a Pile Excavation Rig (150 piles x 1.5m diameter x 22metres deep all cleaned out on time and on budget) equipment rented to Christiani & Nielsen Ltd at Canary Wharf in East London (1985 – 1986) finally moving to Doornbos Equipment in 2004 as Sales Director until 2009. David enjoys classic cars & travelling.



Franz Trieb graduated from the Higher Technical School of Mechanical Engineering in 1979. In November 1979 he joined the R&D and Design Department of Bohler Hochdrucktechnik. Franz joined the Sales Department in 1986 as Product Manager for high pressure pumps.

Presently, Franz Trieb serves as President & CEO of BFT GmbH (formerly Bohler Hochdrucktechnik and BHDT). He holds 15 patents on high pressure pumps and special waterjet applications and has 16 registered trademarks. With more than 39 years of industry experience, he has a special knowledge of pumps and components for high pressure application up to 1,200 MPa working pressure.

**Session 5 – Fundamentals – Part 2****Professor Vanessa Cutler, Consultant, UK**

Vanessa is now a Senior Lecturer at Chichester University delivering Product Design as part of a new Engineering and Product Design Department. She is an Artist, Academic and Consultant. Vanessa was Professor of Glass at University of Wales Trinity Saint David Swansea, 2008-2015. Lecturing on the graduate and post-graduate glass programmes. Trained initially in Stained Glass at Swansea, before going onto a Masters at Wolverhampton, where she was introduced to waterjet technology. Since 1997 she has specialised in using waterjet technology creatively. Gained a PhD from Sunderland University in 2006 and has worked with many artists to incorporate the technology into their practice. Author of "New Technologies in Glass" published by Bloomsbury (2012). It discusses various technologies that can be applied to glass practice. She continues to work with water jet companies which sees her knowledge applied in an engineering capacity rather than creative, demonstrating the ability to diversify across subjects areas.

**Session 6 & 7 – Machining, Part 1 & 2****Alex Jenkins, Decontamination Centre of Expertise Lead, Sellafield Limited, UK**

Alex is a degree qualified Chemist, Chartered Chemist, Chartered Scientist and a Fellow of the Royal Society of Chemistry in the UK. He has been conducting nuclear decontamination across a range of plants and challenges for over 15 years. As a Water Jetting Association qualified water jetter, he has been conducted numerous water jetting projects at Sellafield, setting the standard for the industry and in doing so, has investigated incidents too. Part of Alex's role includes the development of tools and techniques to support the future needs of the nuclear industry, primarily at Sellafield.

**Session 8 – Nuclear Applications****Professor Ramulu Mamidala, University of Washington, USA**

Professor Ramulu received his Bachelor of Engineering (BE) with distinction in 1974 from the Osmania University, India, Master of Technology (M.Tech) in Production Engineering in 1976 from the Indian Institute of Technology, Delhi, and a Doctor of Philosophy (PhD) in 1982 from the University of Washington. He has been a faculty member in mechanical engineering since 1982, and adjunct professor in Industrial & Systems Engineering and Materials Science & Engineering. His research interests have been in the area of mechanics, materials, and manufacturing processes. His current research interests are in the area of mechanics of manufacturing processes and specifically on the mechanics of traditional and High Pressure Waterjets composite machining. His research efforts in Waterjet Technology as applied to Aerospace Industry are well recognized and received professional achievement award twice from Boeing Company. Recently, he has extended waterjet research into Peening of Aerospace metallic Materials. He is a Fellow of ASME, SME, ASM and SME.

