



## Consultant of the Year Award 2008

Entry on behalf of Mike Creamer - Business Edge Ltd

### Introduction

Following a career embracing a diverse range of disciplines across the refrigeration and air conditioning industry, Mike Creamer of Business Edge Ltd. has emerged as one of the leading consultants and technical experts of his generation.

In his roles as consultant, trouble-shooter, expert witness, trainer, design guru and author, his multidisciplinary abilities and authoritative opinion are sought equally by global players and specialist firms in the UK and, increasingly, internationally.



*Mike proving the COP, Compressor Isentropic Efficiency and Capacity of systems at Dimplex HQ*

In his role as consultant, Mike has:

- **Been key technical expert witness** in a number of successful multi-million pound legal cases;
- **Overseen** the diagnosis and rectification of major plant failure and malfunction, that have defeated other industry experts;

- **Championed** the introduction in the UK of ground-breaking new technology (ClimaCheck and Fri3Oil), that is revolutionising the way the industry monitors and maintains plant;
- **Developed** a new professionalism for the training for acr engineers, emphasising the importance of understanding the principles and science behind thermodynamic processes and technology, now once again gaining ascendancy;
- **Pioneered** the development of industry-leading software, now adopted as standard across the industry.
- **Improved** the level of knowledge across the industry generally through the clarity and accessibility of his prolific educational writings.

### **Background to the Mother Ship - Business Edge Ltd**

Mike launched Business Edge Limited in January 1990, with three main objectives:

- a) To deliver high quality technical training to the air conditioning and refrigeration industry;
- b) To develop state-of-the-art electronic control systems and engineering software that would transform the way the industry worked;
- c) Provide expert consultancy to assist the industry with highly technical and contested legal issues on the frontiers of knowledge.

Nearly two decades later, as a result of a great deal of hard work and creative application of his multidisciplinary skills, Mike Creamer and the company he founded is recognised as one of the foremost providers of Technical Training and Certification Courses to the industry, and Mike's expert consultancy services are renowned nationally – and increasingly internationally.



*Mike in action at one his popular and regular Business Edge Open Day Technical Conferences. These are attended by up to 60 industry leaders and professionals.*

The company began the development of advanced Engineering Software in the form of its now industry standard heat gain/heat loss calculation software to CIBSE engineering level, known as the Quantum Suite. It has since then built on this with a range of programs for major manufacturers including Mitsubishi Electric, Weatherite, Lennox

In 1991, Mike Creamer incorporated Advanced Refrigeration Technology Limited, which has designed and developed approximately 30 A/C & R electronic control and protection products. Produced in the UK, literally tens of thousands of these products have been sold to well-known OEMs.

Performance Inspection with ClimaCheck																	
HAFIC.MHX										art	art	CGP	Wan	Trg			
										0.01	1.00		0.10	1.00			
No of Blows	2.0				5.0				11	10	0.3	1.0	1.0	1.0			
216	7.0				10.0				100	75	0.00	4.0	0	0			
										A.7			0.0	0.0			
Evap. Sec.					Cond. Sec.					Compressor							
Low Pres. Ref.					High Pressure Ref.												
19.3	19.3	4.81	4.9	13.3	6.4	22.0	42.8	16.46	-0.4	4.1	70.7	67.6	8.4	6.86	34.0	4.87	
19.4	19.3	4.82	4.8	13.4	6.4	22.4	42.8	16.46	-0.6	4.1	70.8	67.6	8.4	6.86	34.2	4.86	
19.3	19.3	4.79	4.4	13.2	6.2	22.1	42.3	16.36	-0.2	4.0	70.4	67.6	8.3	6.80	33.7	4.86	
Time	Sec1 Evap in (°C)	Sec2 Evap out (Range) (°C)	Sec3 Ref Low (°C)	Sec4 Ref High (°C)	Sec5 Super (°C)	Sec6 SubC (°C)	Sec7 SubH (°C)	Sec8 Ref Cond (°C)	Sec9 Sub Cond (°C)	Sec10 Sub High (°C)	Sec11 Mid point (°C)	Sec12 Ref Cond (°C)	Sec13 Power (kW)	Sec14 CGP (%)	Sec15 Cap. (kWh)	Sec16 CGP (kWh)	
130218	19.3	19.3	4.80	4.9	13.4	6.4	22.1	42.3	16.36	-0.2	4.0	70.7	67.3	8.4	6.86	34.2	4.86
130219	19.3	19.3	4.80	4.9	13.4	6.4	22.1	42.3	16.36	-0.2	4.1	70.7	67.1	8.4	6.86	34.0	4.86
130208	19.3	19.3	4.80	4.8	13.4	6.4	22.1	42.4	16.36	-0.2	4.2	70.7	67.2	8.4	6.86	34.1	4.86
130200	19.3	19.3	4.79	4.4	13.3	6.4	22.2	42.4	16.36	-0.2	4.0	70.7	67.2	8.4	6.86	34.0	4.87
130100	19.3	19.3	4.80	4.8	13.3	6.4	22.2	42.4	16.40	-0.3	4.0	70.8	67.0	8.4	6.80	33.9	4.86
130109	19.3	19.3	4.80	4.8	13.2	6.4	22.0	42.4	16.40	-0.3	4.1	70.8	67.1	8.4	6.80	33.8	4.86
130140	19.3	19.3	4.80	4.8	13.2	6.4	22.0	42.4	16.40	-0.4	4.1	70.8	67.2	8.4	6.80	33.8	4.86
130141	19.3	19.3	4.81	4.8	13.3	6.4	22.0	42.8	16.46	-0.4	4.1	70.8	67.3	8.3	6.86	33.7	4.87
130106	19.3	19.3	4.80	4.8	13.3	6.4	22.0	42.8	16.46	-0.4	4.1	70.8	67.1	8.4	6.80	34.1	4.86
130100	19.3	19.3	4.80	4.8	13.3	6.4	22.0	42.8	16.46	-0.5	4.2	70.8	67.7	8.4	6.86	34.2	4.86
130128	19.3	19.3	4.81	4.8	13.3	6.4	22.0	42.8	16.46	-0.9	4.1	70.8	67.4	8.4	6.86	34.0	4.87
130120	19.3	19.3	4.81	4.8	13.3	6.4	22.4	42.8	16.46	-0.9	4.1	70.8	67.3	8.4	6.80	33.9	4.86
130118	19.3	19.3	4.82	4.8	13.3	6.4	22.4	42.8	16.46	-0.9	4.0	70.7	67.8	8.4	6.84	34.2	4.87
130116	19.4	19.3	4.82	4.8	13.3	6.4	22.4	42.6	16.61	-0.9	4.1	70.8	67.4	8.4	6.84	34.1	4.87
130108	19.3	19.3	4.80	4.8	13.3	6.4	22.4	42.8	16.61	-0.9	4.1	70.7	67.8	8.4	6.84	34.0	4.87

An example of the diagnostics and calculation readings taken by Mike during one of his technical cases.

## Mike Creamer – Background and Career Specialities

- Mechanical Design Engineer/Design Draftsman – Cams, gear trains, automatic manufacturing machinery, pneumatic circuit design, extrusion dyes, automated punching machine design, ducted systems design, fan and fan motor assembly design.
- Design of chemical dehumidification machinery;
- Precision heat load calculation for temperature and humidity control systems encompassing applications such as pharmaceutical, confectionary, cigarettes, fridges, air craft hangers, chewing gum and submarine destroyers down to 2% Saturation;
- Design of Software Engineering Products;
- Design of Electronic Control Systems and control and protection strategy for refrigeration and air conditioning systems;
- Development of a wide range of Engineering Training Courses, primarily aimed at the air conditioning and refrigeration sector;
- Presentation of Technical Air Conditioning and Refrigeration Courses, Refrigerant Safe Handling Courses and Design Courses 1990-2000;
- Author of the Master Class – Air Conditioning Technology Series within *ACR News Journal* since 1996 (108 parts of approximately 2,500 words and technical illustrations). Total technical articles written – approximately 145.
- Positions held include:
  - Applications Engineering – Munters & Dunham-Bush

- Chief Applications Engineer (Dunham Bush)
- Marketing Manager – BRD Air Conditioning Ltd
- Sales Manager & Technical Manager – Conder Group
- Sales Director - Refrigeration Technical Services
- Quality Control Director – Margaux Refrigeration Systems Inc.
- Managing Director – Margaux CVC Ltd.
- Managing Director – Business Edge Ltd, Business Edge Software Ltd, Advanced Refrigeration Technology Ltd.
- Partner – Advanced Consulting Engineers

A full CV and personal history can be provided, if required.



*Mike Creamer & Dr. Guy Hundy working together on one of Mike's Trouble-Shooting, Legal & ClimaCheck Performance Proving Projects in London*

### **Recent key activities**

Recent projects carried out include a number of specialist or unusual requirements. These include:

- a) Troubleshooting of specialist refrigeration systems, VRV installations, water chiller installations and scientific refrigeration circuits.
- b) Decommissioning of critical installations, in particular, a very large ammonia plant and an exceptionally large R11/R22-based environmental test facility.
- c) Determination of close control machinery performance in data rooms of a major financial institution, based in London.
- d) Introduction of the ClimaCheck Performance Analyser to the UK market. This is the first instrument of its kind able to determine cooling capacity, heat pump capacity, compressor isentropic efficiency, COP and many other critical parameters of refrigeration systems without the need to determine air flow rates or water flow rates. This technology is now being adopted by leading supermarket chains and is also critically

important in connection with the new Energy Performance in Buildings Directive (EPBD).

- e) Introduction to the UK of the Fri3-Oil Technology which combines Refrigerant Recovery, Refrigerant Recycling (local cleaning) and complete Oil Cleansing of any type of refrigeration systems, all within a single item of portable plant.



*Presentation of the Fri-Oil Technology to 60 leading Engineers and End Users.*

### **Legal and Arbitration Work**

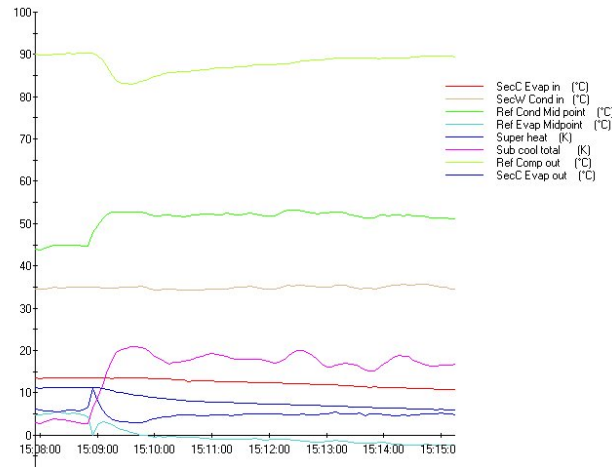
Arbitration is a highly specialised form of legal consultancy, requiring authoritative advice and liaison between parties in technical/commercial dispute situations.

Recent examples include:

#### **Water Chiller Dispute**

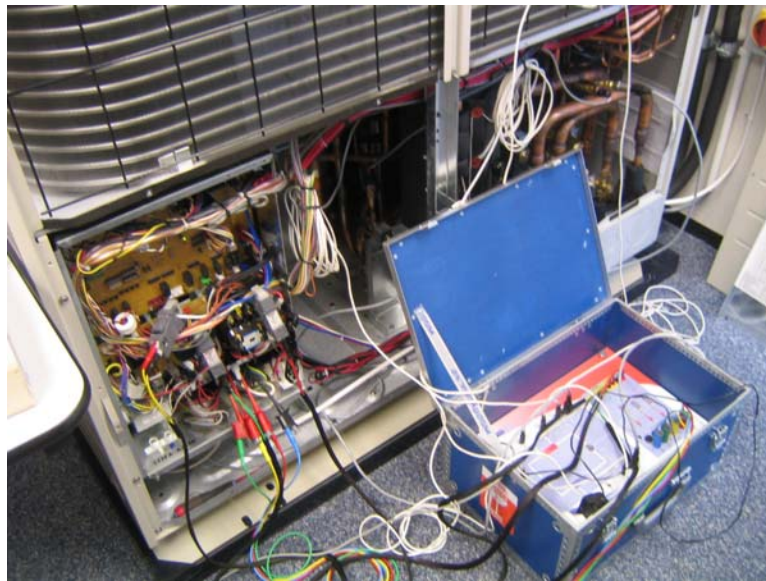
A dispute involving a water chiller supplier, consulting engineers, end user and main building services contractor. Serious chiller failures led to the complete replacement of the original machinery with two new, large water chillers. The end user took the decision to change the machinery following repeated failure of the original machines and was subsequently claiming £440,000 from the other parties (primarily the supplier of the water chillers).

Legal advisors at a Mediation Meeting confirmed that if this were to go to Court, the loser could expect to pay up to £1.2million. Accordingly, all parties agreed to appoint an Independent Expert to review the technical facts and documentation, including Laboratory Reports and to stand by the final decision of that Expert.



*An example of one of 3 formats of Refrigeration Plant Performance using the ClimaCheck Performance Analyser on one of Mike's Projects*

Three potential Experts were selected and Mike Creamer was ultimately appointed. His findings confirmed that the water chiller supplier was partially responsible, but that all parties bore a portion of responsibility. Using the evidence he assembled and based on his technical conclusions, all parties reached an amicable settlement with each agreeing to pay 25per cent of the total cost of replacing the original water chillers.



*ClimaCheck in use at the Business Edge Training Centre where Mike has installed a full 3-Pipe VRF Simultaneous Cool-Heat R410a System*

### **Office Block Air Conditioning Dispute**

This case involved a dispute between the landlord of a large office block in Reading and the tenants. The original and very large water chillers were in dire need of replacement after having provided a reasonable service of 25 years. These machines were now failing on a regular basis and refrigerant leaks had risen to 300 kg/annum.

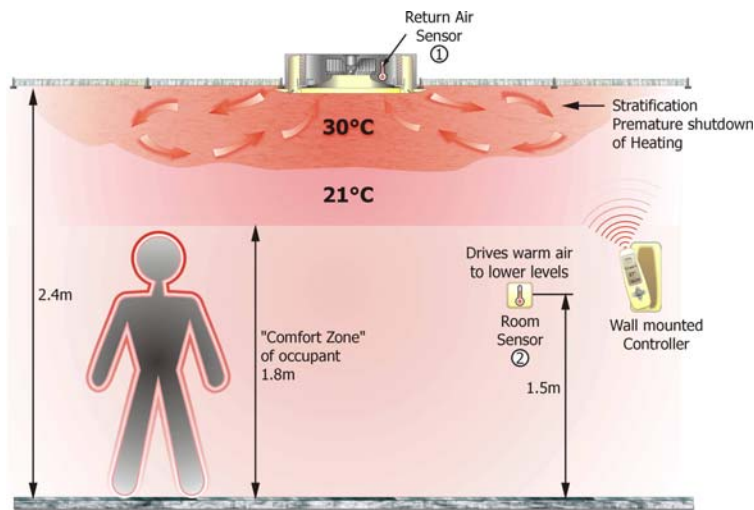
Under the terms of the lease, the landlord required the tenants to pay a contribution towards the cost of three new large water chillers. However, the tenants preferred to continue with the existing maintenance and a repair programme, since this was the cheaper option, regardless of ongoing equipment efficiency, CO<sub>2</sub> emissions and illegal refrigerant losses.

Both parties agreed to abide by the findings of an Independent Expert and Mike Creamer was duly selected and appointed. His findings were independently reviewed by a well-known firm of Consulting Engineers, who had been involved with various aspects of the building services. The case was successfully made for the replacement of the water chillers rather than ongoing repair of the old machines.

### **Air Conditioning Manufacturer versus Distributor**

A leading air conditioning manufacturer became engaged in a long-running dispute with one of its former distributors. The distributor was withholding a very substantial amount of genuinely owed money from the manufacturer, on the basis of a number of alleged Warranty Claims.

After a number of attempts to solve this technically, the remaining part of the dispute was finally handled via Arbitration in London as a means of the manufacturer collecting the commercial debt. The distributor did not deny the amount owed; however, they counter-claimed a larger amount than that of their debt, using 33 technical claims, alleging defects within the manufacturer's air conditioning equipment. The Arbitrator decided to handle both parties' allegations as a single case, and the commercial dispute was transformed into a technical dispute.

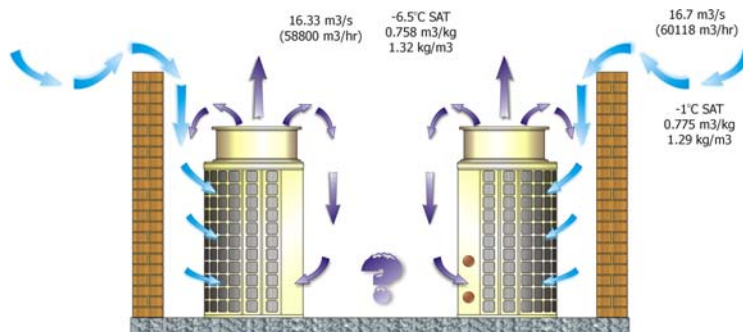


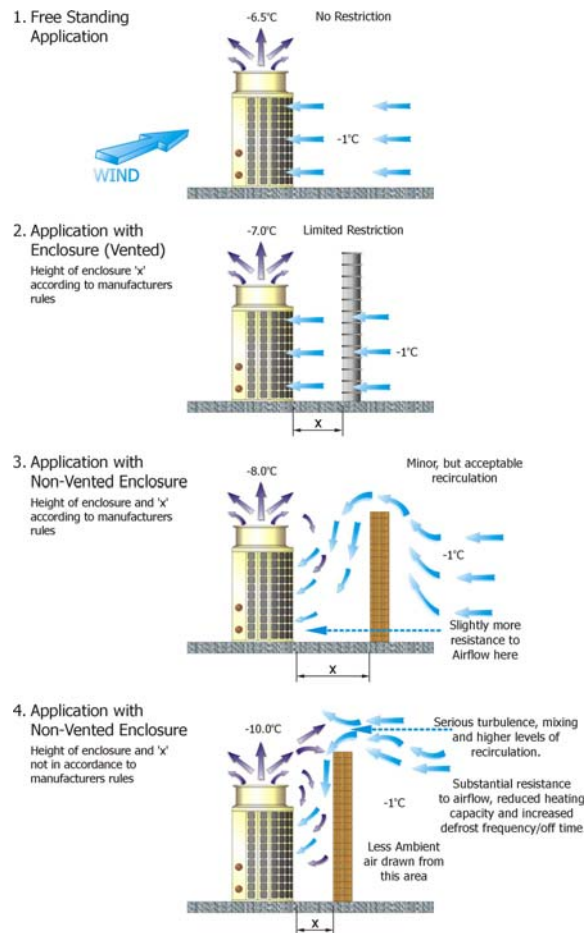
*An example of one of Mike's numerous technical illustrations used in the supporting evidence for this legal dispute.*

Thus, a Technical Expert had to be appointed by each side. After a selection process, the manufacturer decided to appoint Mike Creamer as their Technical Expert to handle this case.

Mike said “Given the volume and complexity of the technical claims, it was necessary for me to conduct an extensive amount of research. In order to discharge my responsibilities fully, I met with the key personnel of the manufacturer’s technical staff. Then, I visited key installation sites that were related to the alleged equipment defects and conducted a wide range of examinations and tests at one site in particular”. These tests included:

- a) Accurate physical measurement and inspection of the installation
- b) Calculation of the heat gains and heat losses on the building, a three storey office structure in Gainsborough
- c) Checks on the quality of the installation in terms of pipe work, brazing, installation, refrigerant charge, etc.
- d) Checks on the control settings within the equipment
- e) Checks on modifications to the equipment made by the opposing company
- f) Smoke tests to determine the air flow pattern within key office areas
- g) Smoke tests to determine the air flow patterns within the outdoor unit compound, where two major VRF Systems were installed
- h) In order to support his findings, Mike produced extensive Site Visit Reports, complete with photos and numerous technical illustrations





*These technical illustrations clearly showed how the Outdoor Units were failing to perform due to the Installers defective installation / design*

Installation parameter settings were compared with the manufacturer's design criteria and significant variations were found. This installation was failing to heat the building adequately, particularly within certain office areas and Mike's findings proved inconclusively that the equipment had been correctly sized for the application (indeed was oversized), yet failed to heat the building accurately *for other reasons as defined below:*

- The outdoor unit compound significantly breached the manufacturer's installation rules, which led to severe short cycling (recirculation) of outdoor air passing through the outdoor units, starving them of the vital heat energy necessary to pass to the building.
- Defects in the design and installation of the outdoor compound also prevented the outdoor units from defrosting adequately.
- A maximum pipe length is clearly defined for each type of installation by the Technical Guidelines set out within the manufacturer's Installation Manuals. The installer strongly claimed that these rules had been carefully followed, but Mike was able to prove that these in fact had been exceeded by over 50 per cent of the upper limit.
- Mike found poorly made refrigerant joints in certain parts of the installation, where instead of using proper reducing couplings, the

installer had simply inserted one pipe inside another and the brazing had partially obstructed refrigerant flow.

- Mike determined that the configuration of indoor units was incorrectly set and that this prevented the system from functioning correctly as a whole, leading to inadequate space temperatures within the building.
- The installation had been configured to use the return air sensors to control the indoor units instead of water mounted sensors recommended for buildings where extensive brazing areas can cause the Resultant Temperature experienced by the occupants to be much lower than the Dry Bulb temperature and this, coupled with stratification issues through incorrect use of the return air sensor, caused major discomfort to the occupants.

During Mike's extensive periods of work, he was required to work with the manufacturer's highly professional lawyers, Arnold & Porter, in order for him to prepare an extensive Witness Statement.

Upon the completion of these works, Mike was then required to meet with the Technical Expert of the opponent. During that meeting, he agreed that the majority of Mike's points were sound and that the technical claims against the manufacturer were indeed unfounded, raising professional doubts over the distributor's case as their errors were now clear. This was a major impact for the distributor's Counsel, as their counterclaim now seemed baseless.

Accordingly, just prior to the Arbitration Hearing, the distributor agreed to settle with the manufacturer, and in accordance with the prior warning, they needed to bear more than 80% of the manufacturer's legal costs, this amount being more than double the amount genuinely owed.

### **Major Water Chiller Dispute**

This dispute arose as a result of the failure by company "A" to pay an outstanding sum of £25,000 to company "B" for the design and installation of a water chiller serving a major building in London.

Company "B" therefore brought an action against company "A" to secure the outstanding monies, which were genuinely owed. Company "A" then raised numerous counter-claims, in general alleging that the water chiller was not fit for purpose in a number of areas.

In addition, company "A" appointed a well-known firm of consulting engineers to advise them on how the special water chiller could finally be brought into operation as company "B" were not granted access to the site in order to complete their final commissioning.



*Mike conducted pipe work Metallurgical and Burst Tests via an independent Test Laboratory, which closely confirmed his Ultimate Pipe Burst Pressure Hoop Stress Calculations, disproving spurious claims that the Water Chiller was unsafe*

The Principal Engineer of the consultancy firm made a number of recommendations, which company "A" duly implemented at considerable expense. Following these extensive works, the water chiller still failed to meet the original design objectives. However, company "A" claimed that their work had been successful and were therefore counter-claiming for the full cost of these works, whereas in fact, this was not true.

The Court ruled that Technical Experts would be required and company "B" appointed Mike Creamer as its Technical Expert in the case. Company "A" decided to appoint as their Technical Expert the same Principal Engineer of the consulting firm that had advised on the unsuccessful modification works.

The Managing Director and Technical Manager of company "B" were highly competent and knowledgeable about their equipment design and installation. Mike was thus able to secure key technical information required in respect of the machine. He visited the installation site on two occasions and used a ClimaCheck Performance Analyser to determine the running condition of the water chiller in addition to conducting many other elements of inspection.

Mike also had to deal with allegations that the refrigeration pipework was unsafe in terms of its diameter and wall thickness for the maximum operating pressures involved. Thorough consideration of the Pressure Equipment Directive and EN378-2000 was required, since several arguments arose in these areas relating to design calculations and safety.

Further allegations in respect of inadequate air flow, fan motor power, condenser capacity and safety rating, control system, expansion valves, refrigerant charge, etc also had to be investigated and dealt with.

This work took place over a period of some 15 months and led to an extensive Joint Expert Report amounting to almost 80 technical points. Mike disagreed

with almost all of the opinions and technical claims made by the opposing Technical Expert. This caused the Judge to state that “she had never experienced such disagreement between two Technical Experts” and that she would therefore cross-examine both Experts simultaneously.

Says Mike Creamer: “My mission was clear - to establish the truth and to set this out correctly and accurately in writing. Accordingly, I produced numerous technical drawings, calculations, photographs, ClimaCheck Performance Analyser test results, Hoop Stress Calculations and independent Laboratory Reports to support my findings.

He adds: *“Moreover, my findings were also supported with the documented responses of all the key manufacturers of the components used in the production of the special water chiller, including the condenser coil manufacturer, fan motor and power inverter manufacturer, and the compressor manufacturer, among others.”*

When the work was completed, Mike had produced some 60 supporting Technical Documents in addition to an extensive Witness Statement. The opposing Expert had produced only two documents.

A few weeks before the trial date, set for 14 July 2008, company “A” capitulated and settled the outstanding amount of £25,000 plus all of Mike’s client’s legal costs in full in a final settlement figure totalling £110,000. This saved both parties substantial additional costs which would have otherwise been incurred if this dispute had gone to Trial with up to five days in Court.

## **Energy Conservation Projects**

Mike has worked extensively on revolutionary and highly confidential Projects, including those intended to utilise substantial quantities of waste heat energy, at varying temperatures, in order to generate useful electricity or heating / cooling. Most projects are subject to a NDA’s (Non Disclosure Agreements), which prevent their content being disclosed, but the following sets out the elements that have been part of this work:

- The marriage of existing technologies with new developments in refrigeration.
- High refrigerant mass flow rates
- Refrigerant subjected to high pressures (consequently the diameter and strength of the refrigeration pipework and associated vessels has been carefully calculated in order to comply with the Pressure Equipment Directive and Safety Regulations.
- Extensive levels of calculation work, coupled with control and protection logic development in order to ensure that prototype Test Rigs and subsequent production builds are successful, efficient and safe.

Mike Creamer is currently the a Leader of a Research & Development Team, which includes specialists in advanced mechanical and electrical engineering, control and protection systems and heat exchanger technology. The Team members are qualified up to Doctorate and Professor Level.

## **R22 to R422D Conversion**

In Q2 of this year, Mike Creamer carried out a refrigerant retrofit on a critical water chiller serving the Morgan Stanley data rooms within the Aviva Tower, London.

This variable speed Water Chiller, developed and constructed by Mike in 1987, had run successfully on a 24/7 basis ever since. In fact, it is the only surviving and original machine within the building - all other water chillers have either worn out or burnt out. *"Some water chillers were damaged by the IRA bomb blast in this area many years ago, but this machine survived even this event!"* comments Mike.

The Water Chiller has a capacity of approximately 450kW and comprises 2 Bock F16, 6 cylinder compressors, each driven by a 45kW Schorch Motor. These in turn are driven by 45kW power inverters. This was the first reciprocating variable speed compressor VRF Water Chiller of its kind, and still represents cutting edge technology for its time. It is specifically designed to continue running even if the electronic control system were to completely fail and consequently has never broken down in almost 21 years.

The energy saving potential of this machine has been demonstrated admirably over this extensive time period and its running current, for example, will vary from only 20 Amps/Phase at minimum load up to 180 Amps/Phase at maximum load, with both compressors running at 1650 rpm.

The ClimaCheck Performance Analyser was used to check the initial operation of the Water Chiller under high load conditions, whilst running on the original R22 refrigerant. Discharge temperature was 69°C (typical for R22 under these conditions) and the key parameters such as discharge pressure, suction pressure, heating capacity, power input and isentropic efficiency were noted.

Following the introduction of the R422D refrigerant, the discharge temperature fell to 58°C and the overall performance of the machine was improved substantially.

## **Why Mike Creamer deserves to win the Award**

During a wide-ranging 40 year career that has embraced many disciplines across air conditioning, supermarket, low temperature and variable speed refrigeration, electronic control systems and engineering software, Mike Creamer has made an outstanding contribution to his clients' businesses and the AC&R industry as a whole.

This is demonstrated in his depth of knowledge and experience – sought by the largest companies at home and overseas; the central role he has played in the resolution of intractable legal disputes; his powerful advocacy of new technologies that transform the way the industry operates; his creativity in developing software and control products that have become industry standards; his prolific production of nearly 150 technical articles and his pioneering activities in training the next generation of Engineers.

Few in the industry have achieved as much in the realm of specialist A/C and Refrigeration consultancy as Mike Creamer. It all adds up to a compelling case.

He would make a worthy winner.

