



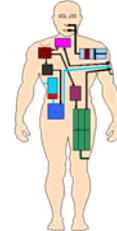
**8I3M coming to Victoria, BC, Canada.**



**IPEMS Phase 1 is complete.**



**Newton adds physiological model.**



**Our latest installations, and more.**

# Measurement Technology NeWs

Newsletter published by Measurement Technology NW

Spring 2010

**Measurement Technology NW** (Seattle, Washington), and the Sport Innovation Centre at Canada's Pacific Institute of Sport Excellence are co-hosting 8I3M - the Eighth International Meeting for Manikins and Modeling. This event will be held August 22-26, 2010 in the beautiful city of Victoria, BC, Canada. Details at [www.i3mmeeting.com](http://www.i3mmeeting.com).

8I3M provides an opportunity for international experts to share their experiences with thermal manikins and thermal modeling. All aspects of manikin and human modeling presentations including research, project development, and applications will be considered at this meeting. Everyone involved in thermal comfort and protective clothing research is invited to participate in 8I3M. We'll be looking for you!

## 8I3M Schedule of Events & Activities

### Sunday August 22, 2010:

Arrive in Victoria, Pre-registration and Welcome Reception (6pm) at the Hotel Grand Pacific.

### Monday August 23, 2010:

Onsite registration at SPIN/PISE, 8am. Conference officially opens at 10am. Dinner buffet (onsite) begins at 7pm.

### Tuesday August 24, 2010:

Oral and poster presentations continue.

### Wednesday August 25, 2010:

Oral and poster presentations (AM). Choice of Victoria-area excursions (PM), subject to change.

### Thursday August 26, 2010:

Presentations conclude, Farewell Banquet at hotel (7pm). Conference closed.

### Friday August 27, 2010:

Return home or stay to visit local Victoria destinations.

8I3M attendees are encouraged to stay at the Hotel Grand Pacific ([www.hotelgrandpacific.com](http://www.hotelgrandpacific.com)). Conference attendees are responsible for their own lodging & travel arrangements.

Victoria is Western Canada's oldest city, originally settled in 1843 as Fort Victoria - a regional outpost of the Hudson's Bay Company. The region's proud history is preserved in the city's inner harbor area, but not far away the future shines bright. The Pacific Institute for Sport Excellence (PISE), located at Camosun College, is a unique sport development model that brings together the disciplines of sport science, sport technology/innovation, sport education, and athlete development under one roof. This 80,000 square foot facility is home to world-class Olympic and Paralympic athletes, physiologists, and sport technology researchers.

PISE is also home to the Sport Innovation and Research Center (SPIN) which operates a high-performance testing and monitoring lab with a focus on product testing and prototype development. Access to high-performance athletes as well as world-leading sports scientists and rehabilitation experts across Canada means SPIN is well positioned to turn ideas generated from sport research into new textile and sensor technologies for the athletic/fitness community.



Our 8I3M conference theme "*The Human Engine*" provides a broad backdrop for presentations focusing on measuring, evaluating, and ultimately understanding the complexities that researchers face in replicating human response to environmental factors. As of this newsletter publication date, over 50 paper and poster submissions have been received - a very strong response that we believe will result in a lively, engaging, and full-spectrum meeting for our thermal comfort research community.

Please do make plans to participate in this important 2010 event. Miss 8I3M, and your next opportunity isn't until 2012!



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Measurement Technology NW manufactures a wide range of precision instruments for measuring and evaluating the thermal comfort of textiles, garments, and dynamic thermal environments such as aircraft, truck, and automobile interiors. Our line of thermal manikins and guarded hotplate systems are designed to support all current industry test standards for thermal insulation and moisture permeability.

# "IPEMS" Robotic Mannequin Update

## **IPEMS Phase 1 is complete!**

Back in November 2008, Measurement Technology NW and a group that included Midwest Research Institute, Boston Dynamics, Smith Carter CUH2A, and HHI Corporation, were selected by the US Army to design and build "IPEMS" (Individual Protection Ensemble Mannequin System). This project includes state-of-the-art chemical testing facilities and a first-of-its-kind robotic thermal mannequin to perform high-resolution testing of protective clothing and equipment under live chemical exposure conditions.

The IPEMS mannequin is envisioned as a freestanding, self-balancing robot that will simulate human physiology for realistic tests of protective equipment in a controlled environment.

Measurement Technology NW's role is to develop IPEMS's skin surface segments and thermal control systems, while other partnering companies developed the robotic mannequin's internal structure. Because these elements must be compatible with each other, MTNW engineers worked closely with the robotic team throughout 2009 to complete an IPEMS design that met the project's rigorous specifications.

Integrating full function thermal, perspiration, and chemical sensing controls into a 50th percentile body form, while also fitting it over an internal robotic structure capable of ranges of movement far beyond that of existing mannequin systems, presented some significant challenges. Adding more complexity to this challenge was the need for sealed skin surfaces and joints to prevent chemical agent contamination, while still allowing internal access for service and repairs.

An early decision to use hydraulic actuation for the robotic motions raised an issue of how to mitigate the internal heat they generated, but it also paved the way for MTNW engineers to design a thermal management package that provided both heating *and* cooling functions - thus maintaining the mannequin's thermal energy balance requirements.

Several shell (skin) prototypes were tested to optimize performance and to refine fabrication procedures. Weight and space limitations required new lamination and embedding technologies as well as customized miniaturization of key electronic components.

**The IPEMS robot is the latest addition to a proud line of innovative, cutting-edge thermal mannequin projects from MTNW - a list that includes NEMO (2005), ADAM (2001), B0 (1996), and the Thermal Hand/Thermal Foot Test Systems (1989) that started it all.**

As 2009 came to an end, the IPEMS mannequin design that emerged from Phase 1, the design phase, included a body surface segmented into 17 separate hard-shell regions (14 independent thermal zones), each with sweating capability and chemical sensing ports. Due to space required by the internal robotics, IPEMS anthropometric dimensions are at the maximum allowable limits for the selected morphology.



A prototype leg was also designed and built in 2009 to prove the efficacy of Measurement Technology NW's proposed thermal and perspiration systems, while also serving as a vehicle for chemical test exposure to help gauge raw material performance (absorption rates, decontamination requirements) as well as the flexibility and effectiveness of joint seals.

Overall, Phase 1 was a successful effort. The design team assembled for IPEMS proved that project challenges could be overcome, and in the process the path forward into Phase 2, the fabrication phase, was laid out.

Phase 2 will include first-article build up of a mannequin shell region and joint sleeve. After decontamination testing and safety procedures are finalized, work will begin on the first IPEMS mannequin.

# Recent thermal installations and other good news.

MTNW thermal manikin and guarded hotplate systems can be found across the globe, with new installations springing up in Europe, North and South America, Asia, and Australia.

A few special highlights from our recent shipments include the advanced sweating, walking, and breathing Newton thermal manikin we recently delivered to the **Ministry of Home Affairs in Singapore**. We also had the pleasure of building a customized breathing head manikin system for **Public Health Agency Canada**, that will be used for flu and airborne infectious disease research. And last but not least we re-acquainted ourselves with the advanced 34-zone Newton we delivered in 2002 to **Loughborough University**, when the manikin returned to MTNW for a retrofit/upgrade. After installation of new zone controllers, new software, and a new computer, this Newton is once again playing at the top of his game.

GHP and SGHP hotplates were popular items during 2009, with systems of various sizes and complexities delivered to **SGS (Hong Kong)**, **USARIEM**, **University of Delaware**, and **Polartec (USA)**, **Adidas AG (Germany)**, **American University of Beirut (Lebanon)**, and **IPT (Brasil)**.

Stored Energy Test devices were delivered to **3M USA** and **WL Gore**, and the new ASTM standard this device was made for received its official designation as **ASTM F2731** (Standard Test Method for Measuring the Transmitted and Stored Energy of Firefighter Protective Clothing Systems).

The SET device is designed to measure both transmitted and stored heat energy in firefighter protective clothing material systems under a radiant heat load that matches that emitted by a structural fire. In real life, the combination of transmitted and stored heat within protective textiles and composites has been found to be sufficient to cause burn injuries under certain circumstances, and this new device is intended to replicate and measure those conditions.

New products, and continuous product improvement are major driving forces here at MTNW, and we take great pride in the development of new features and superior quality control processes for all our manikin and hotplate models. Want to be the first to know what we're working on? Keep an eye on the MTNW thermal blog at [www.mtnw-usa.com](http://www.mtnw-usa.com)!

## Newton Manikin Rentals

New for 2010, MTNW offers a 26-zone "Newton" sweating and walking thermal manikin system specifically for rental. All rental packages include shipping, onsite startup/training and ongoing technical support via phone, fax, email, or web for the duration of the rental period. Rental timeframes can range from as little as one month, up to six months or more.

Under MTNW's rental plan, 70% of the total monthly rental fee can be credited against the purchase price of a new Newton thermal manikin system. For researchers who plan on purchasing a Newton, this means you can utilize a rental unit immediately - no waiting to start that research project - while your new manikin system is being built.

## Annual Service Support Plan

MTNW's Annual Service Care Package is a comprehensive maintenance and service contract for manikin and hotplate systems. For one annual fee customers receive unlimited technical support plus everything needed to keep their MTNW equipment calibrated and in top operating condition. The annual service support plan includes one on-site visit per year (up to 2 days in length) for equipment tuneup, training, minor repairs, and ThermDAC software upgrades. Major repairs are not included. Call or email us for details!

## MTNW's website blog

If you haven't checked out our website blog yet, go directly to [www.mtnw-usa.com](http://www.mtnw-usa.com) to get caught up on the latest news!



New posts are put up regularly, with inside information on MTNW equipment, tips for advanced product operation, solutions to equipment issues that others have faced, and anything else that occurs to us when it comes time to write another article. We do our best to mix things up and keep it interesting, and if you have any comments, we're listening.

[www.mtnw-usa.com](http://www.mtnw-usa.com)

Measurement Technology NW has established relationships with top thermal instrumentation companies around the world. These representatives help us provide ongoing consultation, project coordination, installation assistance and service support.

In South Korea: Technox, Inc., (Mr. Her, Young-Chul), E-mail: [tni@technox.co.kr](mailto:tni@technox.co.kr)

In Taiwan: Tien Shiang Scientific Instruments Company LTD, (Mr. C. S. Yao), E-mail: [tinshing@ms16.hinet.net](mailto:tinshing@ms16.hinet.net)

In Turkey: Kontrol LTD, (Mr. Serhan Tozar), E-mail: [kontroltest@ttnet.net.tr](mailto:kontroltest@ttnet.net.tr)

In Japan: IDS-ENV, (Mr. Masahiro Kajioaka), E-mail: [kajioaka@ids-env.co.jp](mailto:kajioaka@ids-env.co.jp)

In China: Test International, (Mr. David Pan), Email: [davidpan@test-tech.com.cn](mailto:davidpan@test-tech.com.cn)

In Western & Central Europe: Mesdan S.p.A., (Mr. Claudio Bertolotti), Email: [sales@mesdan.it](mailto:sales@mesdan.it)

# Using Thermal Manikins for Comfort Studies

## High accuracy simulation must mimic human physiological response

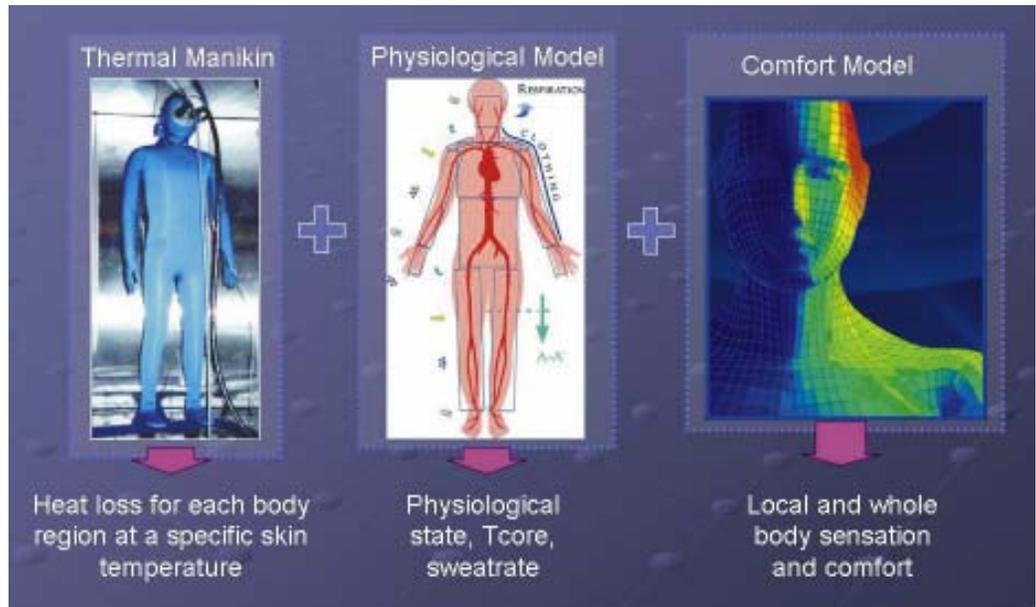
Measurement Technology NW and ThermoAnalytics Inc. have been working together over the past year to integrate an active physiological and comfort model to the Newton sweating thermal manikin system. The rationale behind this project is that:

- 1) Thermal manikins are proven tools for the characterization of garment properties, yet their capabilities remain limited to steady-state test conditions.
- 2) New performance fabric technologies and heightened consumer awareness has led to increased market expectations for thermal comfort.
- 3) Testing under transient and asymmetric conditions (as found in real life) requires a more adaptive and interactive manikin system.

Thus the goal to develop, validate, and perfect a thermal manikin + model solution that establishes "Newton" as a complete thermal comfort testing package. In pursuit of this goal, MTNW engineers have successfully integrated Newton and his ThermDAC control software with the RadTherm **Human Comfort Software** from ThermoAnalytics. RadTherm is a comprehensive heat transfer modeling program that accurately predicts skin temperature, blood pool, and core temperature under a widely varying array of environmental conditions, metabolic activity levels and clothing ensembles.

It is based on the Fiala Model, and includes metabolic heating, shivering, respiration, sweating, and peripheral vasomotion modeling. Outputs include numerical values for **Sensation** (how hot or cold something is perceived to feel), and **Comfort** (whether the sensation makes the person feel good or bad). The RadTherm Human Comfort Software has been validated against experimental human subject data and the results of Fiala's model.

However, real life is not a controlled environment. In order to eliminate the complexities, estimates, and unknowns that plague most virtual simulations, MTNW engineers linked the RadTherm virtual model inputs to Newton, allowing the manikin to act as a multi-zone sensor that measures the rate of heat loss at each surface segment -



responding to and interacting with the environment - to send real data to the model in a continuous feedback loop.

Verification results show that the model-regulated Newton stabilizes and converges to the same solution as a pure virtual simulation (with constant boundary conditions). Tests continue over a wider range of steady-state and transient conditions, but the results to-date have been so encouraging that MTNW is now offering the new Human Comfort Software Model with all our Newton thermal manikin systems.



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