

OSIsoft®

USERS²⁰¹¹ CONFERENCE



Turning **insight** into **action**.



Elite Athlete Monitoring and Analysis using PI System 2010

Presented by **Dr. Denis Boucher, PhD.**
Francois Ruel, eng.

Presentation Agenda

- Who we are
- Projects emerging from this joint venture
- The technology
- The future
- Question



Dr. Denis Boucher PhD
www.denisboucher.com

- We study dynamic systems
- We analyze the state of each system
- We analyze it in continuous and real time
- We then modify the state of the systems in order to improve its capabilities



Francois Ruel, eng.
www.hulix.ca

- We study dynamic systems
- We analyze the state of each system
- We analyze it in continuous and real time
- We then modify the state of the systems in order to improve its capabilities

Turning **insight**
into **action.**

Joint Venture (Summer 2010)

- Dr Denis Boucher (insight)
 - Needs measurement and data analysis for a client
 - Develop test protocols for elite athletes
 - Adapt the technology for mass market in general health improvement and weight loss
- Hulix Conseil (action)
 - Expert in instrumentation and data logging
 - OSIsoft PI System Integrator and member of OSIsoft vCampus
 - Well positioned to deploy the PI System for any size of business
 - Able to develop and integrate the system with a mobile application

Measuring Technology

- Sensors from Zephyr-Technology
- Measuring life like never before
- A new way to analyse the human body
- Millions of data records for a single test



www.lanouvelle.net www.hometownannapolis.com tvanouvelles.ca

Hockey Player Test Protocol (old fashion)



Hockey Player Test Protocol (2010 version)

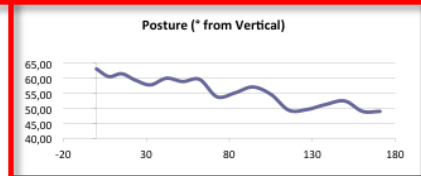
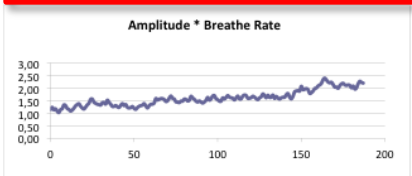
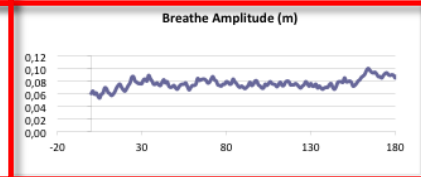
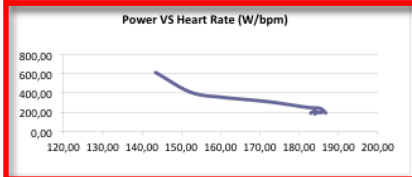
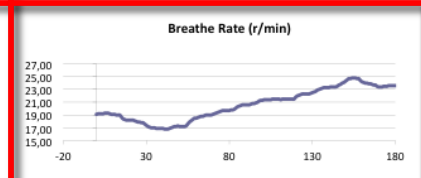
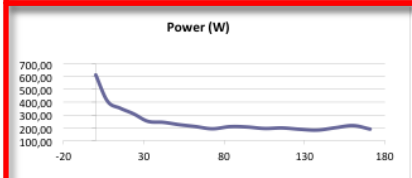
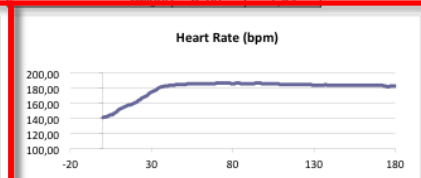
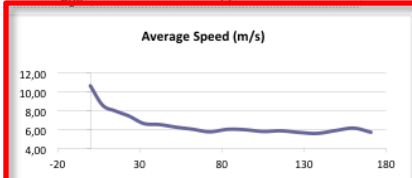


ON-ICE TESTING



Client: Tigres de Victoriaville
Date: October 26th, 2010
Name: **Player 1**
Age: 17

	Imperial	SI
Weight (lbs)	173	78,64
With Equipment	195	88,64
Height	6'-00"	1,83



DATA

Heart Rate	
Predicted	203
Maximum	187
Reserve	16

Power (W)	
Critical Power	202,82
Ratio Pmax	33,04%
Work (KJ)	40,38
WEP (KJ)	3,67

Speed (m/s)		Time to exhaustion	
Max.	10,65	Speed	Secondes
Avg. CP	5,95	8,60	17,95
		7,45	34,33
		6,06	522,34

Run	Start	End	Duration (s)	Speed	Power	% Max Pwr	HR	BR	Amplitude (m)
1	10:10:27 AM	10:10:32 AM	5,63	10,65	614	100,00%	144	19,2	0,059
2	10:10:34 AM	10:10:41 AM	6,98	8,60	407	66,35%	152	19,1	0,063
3	10:10:42 AM	10:10:49 AM	7,51	7,99	354	57,63%	161	18,2	0,071
4	10:10:50 AM	10:10:58 AM	8,06	7,45	310	50,46%	172	17,6	0,080
5	10:10:59 AM	10:11:08 AM	9,01	6,66	251	40,86%	182	16,9	0,079
6	10:11:09 AM	10:11:18 AM	9,16	6,55	243	39,59%	185	17,1	0,073
7	10:11:19 AM	10:11:28 AM	9,55	6,28	225	36,59%	186	18,1	0,073
8	10:11:29 AM	10:11:39 AM	9,90	6,06	210	34,19%	186	19,0	0,082
9	10:11:39 AM	10:11:50 AM	10,38	5,78	192	31,33%	187	19,7	0,076
10	10:11:50 AM	10:12:00 AM	9,92	6,05	209	34,08%	186	20,5	0,074
11	10:12:01 AM	10:12:11 AM	9,99	6,00	206	33,63%	186	21,2	0,074
12	10:12:12 AM	10:12:22 AM	10,31	5,82	195	31,70%	185	21,5	0,076
13	10:12:23 AM	10:12:33 AM	10,19	5,89	199	32,40%	185	22,0	0,074
14	10:12:34 AM	10:12:44 AM	10,49	5,72	189	30,71%	184	22,8	0,072
15	10:12:45 AM	10:12:55 AM	10,69	5,61	182	29,65%	184	23,6	0,074
16	10:12:56 AM	10:13:06 AM	10,13	5,92	201	32,79%	184	24,6	0,079
17	10:13:07 AM	10:13:17 AM	9,72	6,17	217	35,41%	184	23,8	0,093
18	10:13:17 AM	10:13:28 AM	10,46	5,74	190	30,89%	183	23,6	0,088
19									

RECOMMENDATIONS

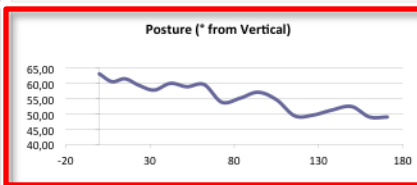
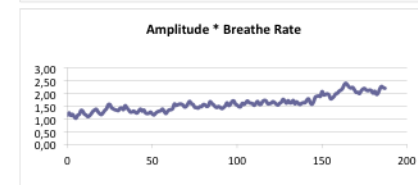
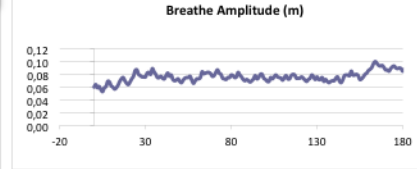
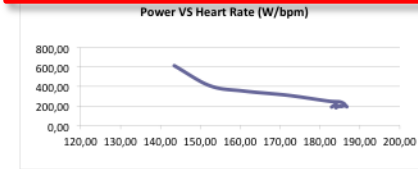
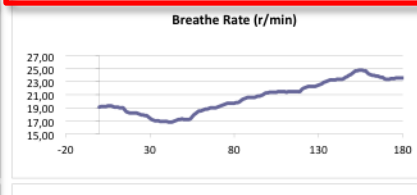
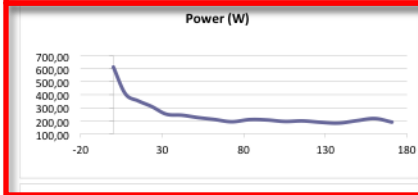
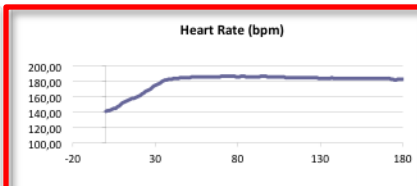
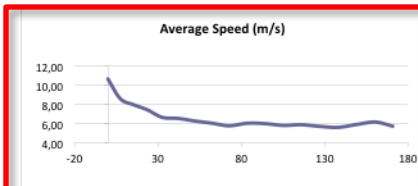
High initial power at 614 watts. Fast power degradation.
Normal physiological parameters.
Critical power at 203 watts, 33% of maximum power.
The player exhausted anaerobic energy rapidly.
The training should aim at delaying the critical power.
Training at high intensity intervals is recommended
Explosive player, but exhausting himself rapidly.

ON-ICE TESTING



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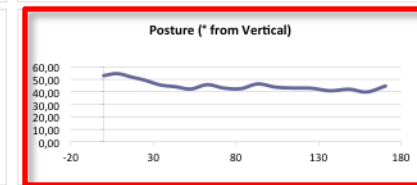
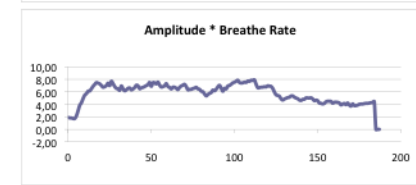
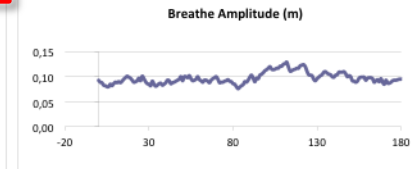
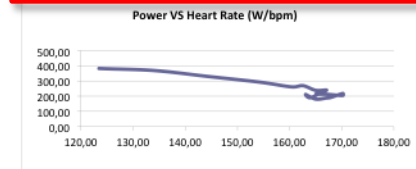
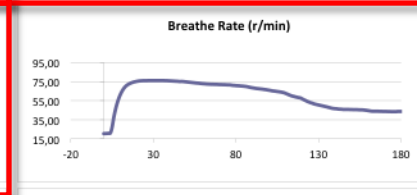
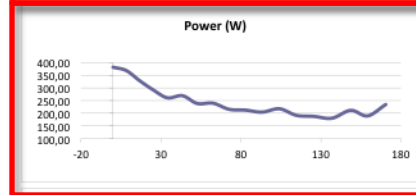
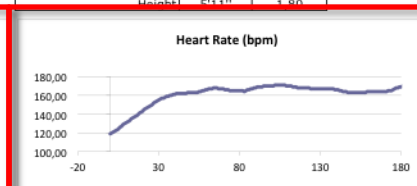
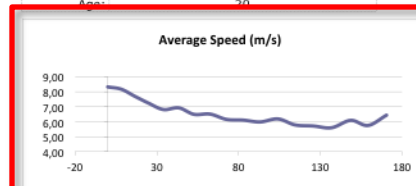


ON-ICE TESTING



Client: Tigres de Victoriaville
Date: October 26th, 2010
Name: **Player 2**
Age: 20

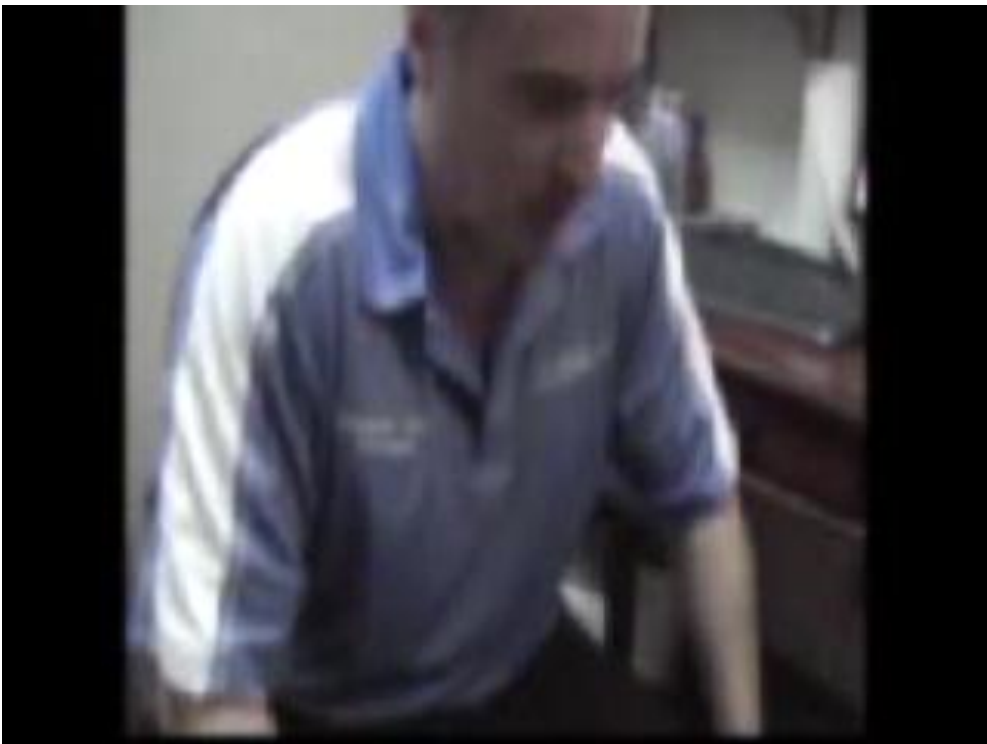
	Imperial	SI
Weight (lbs)	177	80,45
With Equipment	196	89,09
Height	5' 11"	1,80



Speed Skating



Stroke Rehabilitation



- Balance evaluation
- Leg power comparison
- Progress tracking

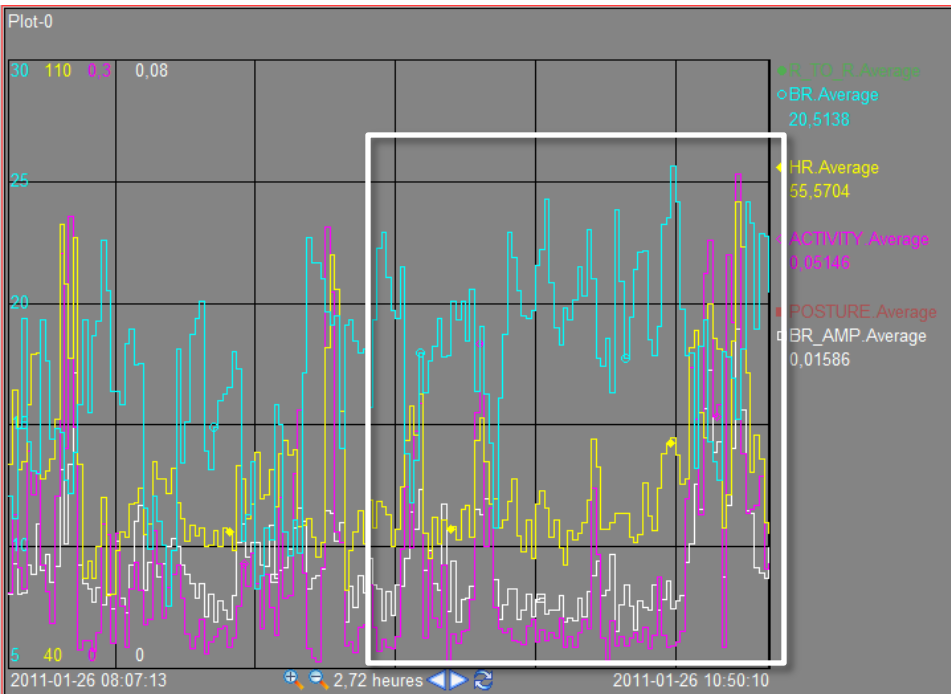
Stroke Rehabilitation (Latest Update)

- Incorporating EEG data
- Merge sensors data
- Test post analysis and progress tracking

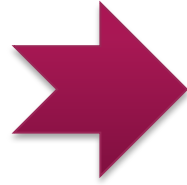


Stress monitoring and analysis

- CEO with blood pressure problem
- 12 hours test means 10 MM lines of data
- PI System visualisation tools helped navigating through the information



How PI System turned the insight into action

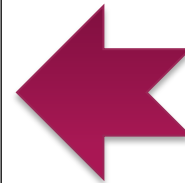
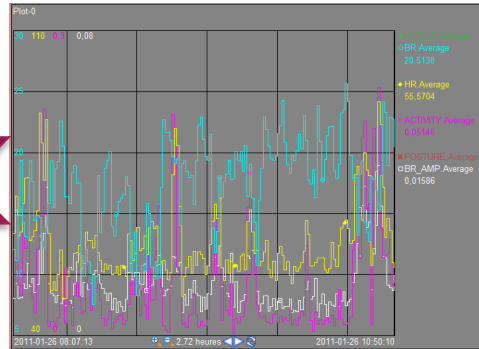
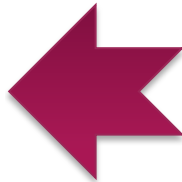


CSV FILE

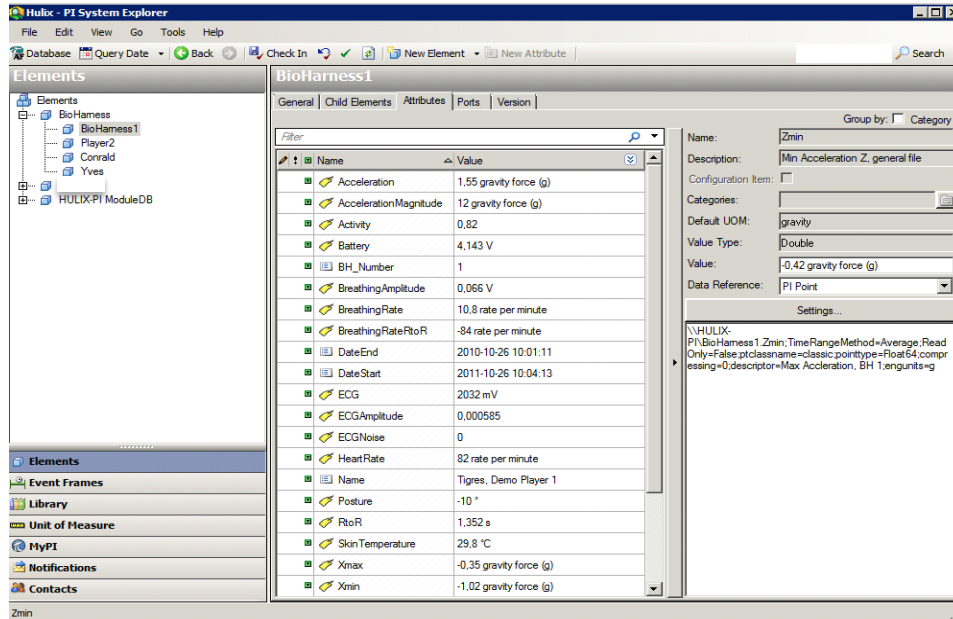


AF SDK

For test creation
and data loading



PI AF Architecture



- Custom application using AF SDK for data loading and EF SDK for tagging the data
- A test is an assets
- PI OLEDB Enterprise and Microsoft Reporting Services

PI System 2010 for short term actions



Data Rate from
1 sample/sec
to
125 samples/sec



PI Web
Services



Data



Analysis

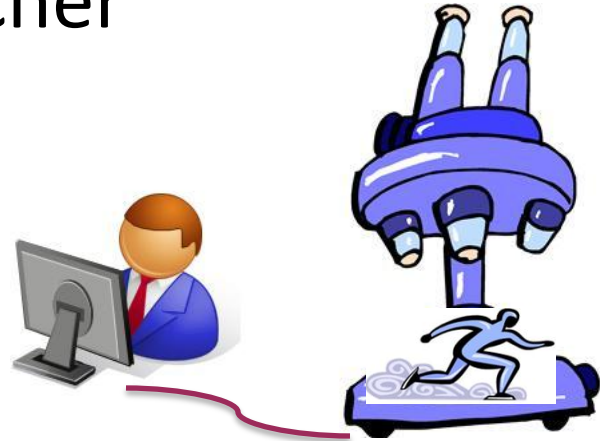


AF & EF SDK



Quotes

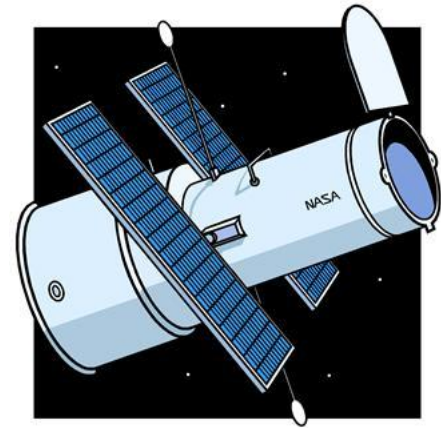
« I have been analyzing data for 20 years, this is the first time I can see the data in its true clarity in real time. » Dr. Denis Boucher



Quotes

« Looking at data gathered by our new sensors and PI System 2010 is the same feeling as when they look at the universe using Hubble. »

Dr. Denis Boucher



Future Projects

- Use PI System to elaborate more analysis rules
 - Mogul Skiing
 - Swimming
 - Cycling, running...
- More rehabilitation
- General health improvement and **weight loss**
- Stress and business monitoring

Conclusion

- PI System 2010 was **the** tool that helped us develop and validate test protocols and analysis
- The **insight** turned to **action** instantly
- Key Benefits:
 - All the right tools packaged together
 - Merging data sources with different sampling periods
 - Having access to advanced tools and support with the OSIsoft vCampus Community Technology Preview



Thank you

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