17th International Conference on Condition Monitoring and Asset Management (CM 2021)

London, United Kingdom
14 - 18 June 2021

09.30   **Plenary Keynote – COMADIT Prize Lecture – [001] Interdisciplinary, like it or not...N/A**

Professor A Ball, University of Huddersfield, UK
Chairs: Professor L Gelman, University of Huddersfield, UK and Professor A Hope, UK

Session 1A – Trained structures and statistical methods in condition monitoring
Chair: **Professor L Kuravsky**

10.00   **[1A1] An approach to diagnostics based on video oculography data analysis...1**

Authors - L S Kuravsky[1], G A Yuryev[1], V I Zlatomrezhev[2], I I Greshnikov[1] and B Y Polyakov[1]
     [1]Moscow State University of Psychology and Education, Russia
     [2]Federal State Unitary Enterprise, State Research Institute of Aviation Systems (GosNIIAS), Russia

10.15   **[1A2] Adaptive aircraft crew training based on probabilistic models for estimating the flight crew capability level...9**

Authors - L S Kuravsky, P N Dumin and G A Yuryev
     Moscow State University of Psychology and Education, Russia

10.30   **[1A3] Identification of the reasons for shaft vibration non-stationarity of the IBR-2 research reactor mobile reflector...N/A**

Authors - V Sizarev[1], D Ognerubov[1], A Volkov[1], S Timofeev[1], A Sokolova[2] and F Balitsky[2,3]
     [1]JSC NIKIET, Russia
     [2]IMASH RAN, Russia
     [3]Spectrum Engineering, Russia

10.55   **[1A4] S-discriminant power method of machinery condition vibration monitoring and some of its applications...N/A**

Authors - A Sokolova[1], F Balitsky[1,2] and V Sizarev[3]
     [1]IMASH RAN, Russia
     [2]Spectrum Engineering, Russia
     [3]JSC NIKIET, Russia

11.10   **[1A5] Features of gearbox diagnostics on the basis of their vibration amplitude-frequency analysis...N/A**

Authors - F Balitsky[1,2] and A Sokolova[1]
     [1]IMASH RAN, Russia
     [2]Spectrum Engineering, Russia

11.25   **[1A6] Optimisation of cockpit displays and controls using touch displays...20**

Authors - I Greshnikov, V Zlatomregey and D Davydov
     Federal State Unitary Enterprise, State Research Institute of Aviation Systems (GosNIIAS), Russia

11.40   **[1A7] Short-term solar radiation prediction in Huddersfield based on the feed-forward neural network...30**

Authors - Z Wang[1,2], G Feng[1], X Liu[2], D Zhen[3], F Gu[1] and A Ball[1]
     [1]University of Huddersfield, UK
     [2]Entrust Smart Home Microgrid Ltd, UK
     [3]Hebei University of Technology, China

13.15   **Plenary Keynote Lecture – [002]: Development of deterioration and predictive models for concrete bridge decks from NDE field and accelerated structural testing data..N/A**
Professor N Gucunski, Rutgers University, USA
Chair: Professor L Gelman, University of Huddersfield, UK

Session 2A – Vibration condition monitoring
Chair: S Mills

13.45   **[2A1] Comparing condition monitoring techniques within the wind industry...40**
Authors - D Hickey, S Maxwell, S Hendren and I Dinwoodie - Natural Power Consultants, UK

14.00   **[2A2] Enhancing bearing signature using minimum entropy decomposition to determine bearing faults in a permanent magnet motor...N/A**
Authors - S Ganeriwala and D Chen - SpectraQuest Inc, USA

14.25   **[2A3] Optimal feature performance analysis in IESFOgram for bearing diagnostics...52**
Authors - A Mauricio[1], S Schmidt[2] and K Gryllias[1]
[1]KU Leuven University, Belgium
[2]University of Pretoria, South Africa

14.40   **[2A4] Condition monitoring and failure analysis of liquefied natural gas plant flow control valve stem packing system...67**
Authors - E S Pereira, B M Alkali and O Niculita
Glasgow Caledonian University, UK

14.55   **[2A5] Pipework vibration – why do we not monitor its condition?...N/A**
Author - I Jarvie - Oceaneering International Services Ltd, UK

15.10   **[2A6] Tool condition monitoring based on vibration signal from an on-rotor sensor in CNC turning process...80**
Authors - C Li[1,2], D Li[1,2], D Shi[3], G Feng[2], B Li[1], F Gu[2] and A Ball[2]
[1]Beijing Institute of Technology, China
[2]University of Huddersfield, UK
[3]Shandong University of Science and Technology, China

15.25   **[2A7] Structural damage detection with frequency-based fitness functions using standard PSO algorithm...92**
Authors - X Li[1,2], R Serra[1,2] and J Olivier [1,3]
[1]Institut National des Sciences Appliquées Centre Val de Loire, France
[2]Laboratoire de Mécanique Gabriel Lamé, France
[3]Laboratoire d'Informatique Fondamentale et Appliquée de Tours, France

15.40   **[2A8] Bearing fault diagnosis with non-stationary speed and load conditions...104**
Authors - S Berrada[1,2], R Serra[1], P Van Dalen[2] and C Chastagner[2]
[1]Institut National des Sciences Appliquées Centre Val de Loire, France
[2]SKF RTD, Netherlands

15.55   **[2A9] Study on the influence of unsteady state on damage estimation of random vibration loading...114**
Authors - Y Wang[1,2] and R Serra[2]
[1]China Academy of Railway Sciences (CARS), China
[2]Institut National des Sciences Appliquées Centre Val de Loire, France

16.10   **[2A10] Wind turbine blades fault detection using system identification-based transmissibility analysis...121**
Authors - X Wang, L Zhang and W Heath - University of Manchester, UK

CM 2021 – Tuesday 15

09.30 **Plenary Paper –**
[003]: Condition monitoring on axial piston pumps: bridging the data gap...N/A

G Herborg-Enevoldsen and C Svendsen, Danfoss, Denmark
Chairs: Professor L Gelman, University of Huddersfield, UK and Professor A Hope, UK

Session 3A – Oil and oil debris monitoring technologies
Chair: **S Greenfield**

10.00 **[3A1] Advanced debris monitoring system...128**
Author - S Greenfield, Eaton Aerospace, UK

10.15 **[3A2] Oil condition monitoring system...137**
Author - X Pu, Eaton Aerospace, UK
(Paper presented by S Greenfield, Eaton Aerospace, UK)

10.30 **[3A3] Earlier detection of potential injector failures in fuel...NA**
Author - B Cutler, Oil Analysis Laboratories, UK

10.45 **[3A4] Analysis of wear and contamination particles from in-service oil and filter samples...N/A**
Author - D Korachkin, Swansea Tribology, UK

11.00 **[3A5] Wear debris monitoring of wind turbine pitch bearing lubrication...NA**
Author - T Nowell, Intertek, UK

11.15 **[3A6] The development of condition monitoring diagnostics for prescribed actions using a combination of artificial intelligence, machine learning algorithms and a modified approach to FMECA...N/A**
Author - D Shorten, Optimain Ltd, UK

Session 3A – Condition monitoring by infrared thermography
Chair: **S Greenfield**

11.50 **[3A7] Equine IRT...N/A**
Author - E Hall, Equine Thermography, UK

12.05 **[3A8] Safe thermographic severity extrapolation in low-energy circuits...N/A**
Author - D Manning-Ohren, ERIKS, UK

12.20 **[3A9] Infrared thermal imaging for bone fracture identification and monitoring of fracture healing: a review of the latest developments...142**
Authors - C L Reed[1], R Saatchi[2] and S Ramlakhan[3]
[1]The University of Sheffield, UK
[2]Sheffield Hallam University, UK
[3]Sheffield Children's Hospital, UK

Session 3A – Advanced signal processing and failure prognostics
Chair: **Dr E Juuso**

12.45 **[3A10] Intelligent stress and condition indicators for adaptation of control actions...151**
Author - E Juuso, University of Oulu, Finland

Session 4A – Human dynamics and biological health monitoring
Chair: **Professor S Noroozi**

14.00	**[4A1] On-body sensing systems: human motion capture for health monitoring...163** *Author - R Haratian* *Bournemouth University, UK*

14.15	**[4A2] Monitoring the kinematics of walking and running gait after total knee replacement using a generation of kinematic retaining prosthetic knee implant...174**
	Authors - S Noroozi[1], E Craig[1], A Harvey[2] and N Aslani[3]
	    [1]Bournemouth University, UK
	    [2]RBCH, UK
	    [3]Diamond Light Source, UK

14.30	**[4A3] Title to be confirmed...N/A** *Author - Professor S Noroozi, UK*

Session 4A – Machinery diagnostics
Chair: **Professor A Kostyukov**

14.55	**[4A4] Digital reliability: 24/7 real-time machinery diagnostics...188** *Author - A V Kostyukov* *Dynamics SPC, Russian Federation*

15.10	**[4A5] Practical use of diagnostic signs of vibration invariant to machinery construction...194** *Author - A V Kostyukov and S N Boychenko* *Dynamics SPC, Russian Federation*

15.25	**[4A6] AI systems based on incomplete knowledge for health monitoring and diagnostics of equipment...200** *Authors - A V Kostyukov and S N Boychenko* *Dynamics SPC, Russia*

15.40	**[4A7] Dividing electrical and mechanical defects of electric motor by short time realisations of vibration signal...204** *Authors - S N Boychenko and A Kostyukov* *Dynamics SPC, Russia*

15.55	**[4A8] Stress control – the main direction in the development of technical diagnostics and condition monitoring...209** *Authors - A Dubov and S Kolokolnikov* *Energodiagnostika Co Ltd, Russia*

16.10	**[4A9] CNN-based early classification of rotating machinery fault diagnosis...220** *Authors - D Yang, H Karimi and K Sun* *Politecnico di Milano, Italy*

16.25	**[4A10] Development of magnetic eddy current sensor for online corrosion monitoring of ferromagnetic pipelines...N/A** *Author - W Rukhshinda* *London South Bank University, UK*

16.40	**[4A11] Interference of variable frequency (VFD) on rotating machinery fault diagnosis ...N/A** *Author - S Ganeriwala, SpectraQuest, USA*

09.30 **Plenary Paper – [004]: Intelligent fault diagnosis of rotary machinery...N/A**

Professor H Karimi, Politecnico di Milano, Italy
Chair: Professor L Gelman, University of Huddersfield, UK

Session 5A – Workshop on multicopters for inspection
Chair: **Dr C Brett**

10.00 **[5A1] Maximising efficiency of drone-captured data though digitalisation...N/A**
Author - M Whitton
Cyberhawk, UK

10.15 **[5A2] Development of a training programme for the safe use of drones in industrial inspections...N/A**
Author - R Rudd
ECITB, UK

10.30 **[5A3] Delivery of contact inspections using drones...N/A**
Authors - P Khalili, A Garriga Casanovas and F Cegla
Imperial College London, UK

10.45 **[5A4] HOIS guidance for UAV-based external remote visual inspection...N/A**
Author - S Burch
ESR Technology Ltd, UK

11.00 **[5A5] Advances in contact-based non-destructive evaluation using unmanned aerial vehicles...N/A**
Authors - R Watson, T Zhao, D Zhang, J Cao, C MacLeod and G Dobie
University of Strathclyde, UK

Session 5A – Design, motion estimation and condition monitoring
Chair: **Professor R Serra**

11.35 **[5A7] Design and development of an exoskeleton prototype arm utilising electromyography...225**
Authors - J Gornall, B Mandia, L Downing and R Saatchi
Sheffield Hallam University, UK

11.50 **[5A8] Detecting corrugation defects in harbour railway networks using axle box acceleration data...236**
Authors - J Heusel, B Baasch, W Riedler, M Roth, S Shankar and J C Groos
German Aerospace Center (DLR), Germany

13.00 **Plenary Paper – [005]: LiDAR system applications for improving condition monitoring and asset management of railways...N/A**

Professor M Ahmadian, Virginia Tech, USA
Chair: Professor L Gelman, University of Huddersfield, UK

Session 6A – Vibration monitoring and NDT methods and technologies
Chair: **Professor A Hope**

13.30 **[6A1] Update on ISO standards in condition monitoring and vibration...248**

Author - S Mills
  SpectrumCBM Ltd, UK

13.45 **[6A2] Visualising vibration: a 'gamechanger' for troubleshooting, diagnostics and root-cause analysis...N/A**

Author - D Whittle
  RMS Ltd, UK

14.00 **[6A3] Vibration analysis case studies from wind turbines...263**

Author - D Futter
  Bachmann Monitoring GmbH, Germany

14.25 **[6A4] Industry 4.0 and vibration monitoring – a compromise between data quantity and data quality...N/A**

Author - D Manning-Ohren
  ERIKS, UK

14.40 **[6A5] Predictive techniques and analytics: experience and expectations in Industry 4.0 ...N/A**

Author - T Pyne
  Center for Reliability and Diagnostics, India

14.55 **[6A6] Advances in non-invasive inspections: a review on methods and tools...272**

Authors - M Alotaibi and M Khan
  Cranfield University, UK

15.10 **[6A7] Image representations of vibrations and their application in fault diagnosis of roller bearings: an overview...N/A**

Author - H Ahmed
  Brunel University London, UK

CM 2021 – Thursday 17

09.30 **Plenary Keynote Lecture – [006] Radiometric partial discharge condition monitoring for high-voltage electricity substations...N/A**

Professor P Lazaridis, University of Huddersfield, UK
Chairs: Professor L Gelman, University of Huddersfield, UK and Professor A Hope, UK

Session 7A – Condition monitoring methods and technologies
Chair: **Dr L Alboul**

10.00 **[7A1] Analysis of vibration frequencies as a method of screening for long bone fractures in children...285**

Authors - D Fennimore[1], R Ali[2], L Alboul[2] and A Offiah[1,3]
  [1]University of Sheffield, UK
  [2]Sheffield Hallam University, UK
  [3]Sheffield Children's NHS Foundation Trust, UK

10.15 **[7A2] A smart sleep apnoea detection service...294**

Authors - R Barika, A Shenfield, H Razaghi and O Faust
  Sheffield Hallam University, UK

10.30 **[7A3] Validating a deep-learning model for atrial fibrillation detection...311**

Authors - M Kareem and O Faust
  Sheffield Hallam University, UK

10.55 **[7A4] Adaptive sampling and quality of service for image transmission for e-health applications...N/A**

Authors - A Salama and R Saatchi
  Sheffield Hallam University, UK

11.10 **[7A5] Kohonen neural network analysis of postural sway in stand-still position in healthy adult subjects...N/A**

Authors - O D Ojie and R Saatchi
  Sheffield Hallam University, UK

11.25 **[7A6] Non-contact respiration rate monitoring: an evaluation of four methods...316**

Authors - H Stratton[1], R Saatchi[1], R Evans[1] and H Elphick[2]
  [1]Sheffield Hallam University, UK
  [2]Sheffield Children's Hospital, UK

11.40 **[7A7] A critical overview of machine learning approaches in structural health monitoring and assessment: smart composites...326**

Authors - I Omar, M Khan and A Starr
  Cranfield University, UK

11.55 **[7A8] Detection of anomalies on signals during aircraft engine tests: methodological comparison between historical, statistical and deep-learning approaches...338**

Authors - Y Rotrou[1], M Yahia-Bacha[1], J Muller[2] and Y El Amraoui[2]
  [1]Safran Aircraft Engines, France
  [2]Ezako, France

12.20 **Plenary Keynote Lecture –** **Apprenticeships: the NDT and CM update...N/A**

I Baillie [1] and J Moody [2]
[1]Rolls-Royce plc, UK
[2]BINDT, UK
Chair: Professor A Hope, UK

Session 8A – Condition monitoring method workshops

13.00 **Workshop –** **An animated introduction to vibration analysis training...N/A**
Author - D Whittle
RMS Ltd, UK

14.10 **Workshop – Introduction to oil and oil debris monitoring...N/A**
Author - S Greenfield
Eaton Aerospace, UK

15.20 **Workshop – Key steps to implementing condition monitoring...N/A**
Author - S Mills
SpectrumCBM Ltd, UK

16.30 **Workshop – Induction motor diagnostics...N/A**
Author - S Ganeriwala
SpectraQuest Inc, USA

CM 2021 – Friday 18

09.30 **Plenary Keynote Lecture – [007]: Finite element-based wave propagation modelling for damage detection purposes...N/A**

Professor A Zak, Gdańsk University of Technology, Poland
Chairs: Professor L Gelman, University of Huddersfield, UK and Professor A Hope, UK

Session 9A – Signal processing and modelling of complex systems
Chair: **Dr A Zippo**

10.00 **[9A1] Gear diagnostics: experimental data comparison of radial accelerometers, tangential accelerometers and torquemeter...349**

Authors - A Zippo[1], F Pellicano[1], G Iarriccio[1], L Bergamini[1], G D'Elia[2] and G Dal-Piaz[2]
[1]Università degli Studi di Modena e Reggio Emilia, Italy, [2]Università degli Studi di Ferrara, Italy

10.15 **[9A2] Gear prognostics: a predictive algorithm for lifetime estimation of operating gearboxes...361**

Authors - L Bergamini, A Zippo, F Pellicano, G Iarriccio and M Molaie
Università degli Studi di Modena e Reggio Emilia, Italy

10.30 **[9A3] Time series analysis of arm and forearm measurement for functional electrical stimulation control...370**

Authors - A Zippo, F Pellicano and G Iarriccio
Università degli Studi di Modena e Reggio Emilia, Italy

10.45 **[9A4] Angular-based modelling of a planetary gear set with a tooth crack...380**

Authors - A Telbani[1,2,3], A Bourdon[1], D Remond[1], J Souilliart[2] and M A Hassini[3]
[1]University of Lyon, France, [3]EDF R&D, France
[2]EDF DTG, France

Session 9A – Condition monitoring and NDT methods and technologies
Chair: **Professor R Serra**

11.20 **[9A5] Delivering real CBM results in IoT 4.0 for industry...397**

Authors - A Findlow[1] and P Nash[2]
[1]Hayley 247 Engineering Services Ltd (t/a Drive Management Services), UK
[2]InVMA Ltd, UK

11.35 **[9A6] Real-time monitoring of crack growth in rail track using acoustic emission techniques...412**

Authors - R Culwick, V L Jantara Junior and M Papaelias - University of Birmingham, UK

11.50 **[9A7] Applicability of time series features as health indicators for technical systems operating under varying conditions...418**

Authors - O Kennedy Aimiyekagbon, A Bender and W Sextro - Paderborn University, Germany

12.05 **[9A8] Quantitative analysis of the structural health of railway turnout using acoustic emission technique...432**

Authors - M Kongpuang[1], R Culwick[1], N Cheputeh[1], A Marsh[1], V L Jantara Junior[1], P Vallely[1,2], S Kaenwunruen[1] and M Papaelias[1]
[1]University of Birmingham, UK, [2]Network Rail, UK

12.20 **[9A9] X-ray television scanning detector...445**

Authors - V Troitskiy, M Karmanov and R Pastovenskiy - E O Paton Electric Welding Institute, Ukraine

12.35 **[9A10] Highly sensitive digital X-ray television systems for non-destructive testing...N/A**

Authors - V Troitskiy and S Mikhailo - E O Paton Electric Welding Institute, Ukraine

CM 2021 – Friday 18

Session 10A – Condition monitoring and NDT methods and technologies
Chair: **Professor A Zak**

13.15   **[10A1] Advanced analytics for motor current signature analysis: an overview...N/A**
Author - C Kar
    Honeywell Middle East, Saudi Arabia

13.30   **[10A2] Automated scanning ultrasound testing of brazing...456**
Authors - G Por[1], M Agócs[1], E Kocsó[1], J Molnar[1], P Szabó[1], K Szikszai[1] and M Szabó[2]
    [1]University of Dunaujvaros, Hungary
    [2]Oerlikon Eldim (HU) Ltd, Hungary

13.45   **[10A3] Magnetic characterisation monitoring of changes in corrosion resistance of austenitic stainless steel...N/A**
Authors - B Hu and G Shen
    China Special Equipment Inspection and Research Institute, China

14.00   **[10A4] Assessment of pipe wall corrosion using high-order ultrasonic guided waves...N/A**
Authors - D Cirtautas, V Samaitis and L Mažeika
    Kaunas University of Technology, Lithuania

14.25   **[10A5] Low-power corrosion monitoring for hazardous environments...465**
Authors - C B Thring, D L Lunardi, C Mackenzie, A Rabell-Montiel, D Irving and D A Hughes
    Novosound, UK

14.40   **[10A6] Confounding factors effect on guided wave ultrasonic testing (GWUT)...471**
Authors - O C Samuel, K A Muhammad and A Starr
    Cranfield University, UK

14.55   **[10A7] Statistical analysis of inspection data for probabilistic risk assessments...481**
Author - Y Sokolov
    Quanty Pty Ltd, Australia