Insights into State-of-the-art Mechanical Surface Characterization


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Venue: Facebook School of Mechanical Engineering, Universiti Teknologi Malaysia (UTM)

IMM Southern Chapter in collaboration with the School of Mechanical Engineering, Faculty of Engineering has conducted an online webinar entitled Insights into State-of-the-art Mechanical Surface Characterization. The webinar was delivered by Anton Paar experts; Mr. Phillip Gumpl (General Manager Anton Paar Malaysia Sdn. Bhd.), Ms. Evelin Frank (Global Product Management Indentation Testing), Dr. Maryam Bahrami and was moderated by Dr. Habibah Ghazali of UTM. More than 250 participants from various background and institutions had attended the webinar. The webinar began with an introduction to the main classical hardness testing methods such as Brinell, Vickers, Rockwell, and Knoop tests by Ms. Evelin. These methods however are not suitable to be used when it comes to characterizing the mechanical properties of coatings or thin films, especially down to the nanometer scale. The flexibility of these classical approach also is limited since it can measure only the hardness (permanent deformation). Thus, quasi-static indentation at a lower load (ranging from 20 mN – 30 N) is required (following ISO14577). Both indentation depth and normal cyclic load are monitored all along with the insertion and withdrawal of the indenter as shown in Figure 1(a); the resultant force-displacement curve as depicted in Figure 1(b). This method is mainly applied in tooling (PVD-CVD coating), heat-treated/laminated glass, biomedical (functional implant), electronic (protective layer/display) and aerospace (functional composite) applications. Through this method of characterization, various information can be projected from the deformation area such as elastic modulus, scratch characteristic (adhesion, friction coefficient etc.), indentation depth, fracture toughness, deformation energy as well as viscoelasticity properties. However, to ensure the accuracy and the consistency of the result, one should consider calibrating the indenter tip through a series of indentation measurement on the certified reference materials; to measure tip wear, geometry, and size effects. The speaker has also highlighted that the maximum depth of the indentation must be lower than 10% of the coating total depth to avoid the influence of the substrate. On the other hand, the non-uniform surface finish may create localized stresses on the sample, thus, polishing at a higher grit is required. The participants also had the opportunity to ask questions related to the indentation and scratch properties. Several questions have been raised and were well responded by the speakers.

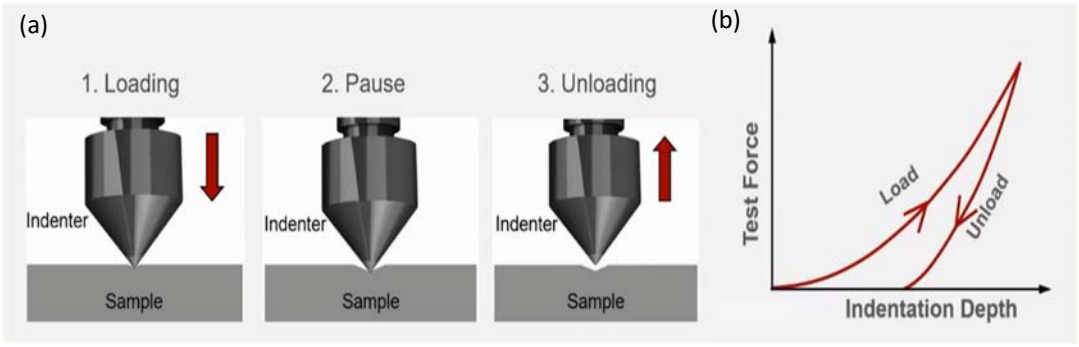

Figure 1: *(a) Cycle of indentation and (b) evolution of force at the indentation depth*

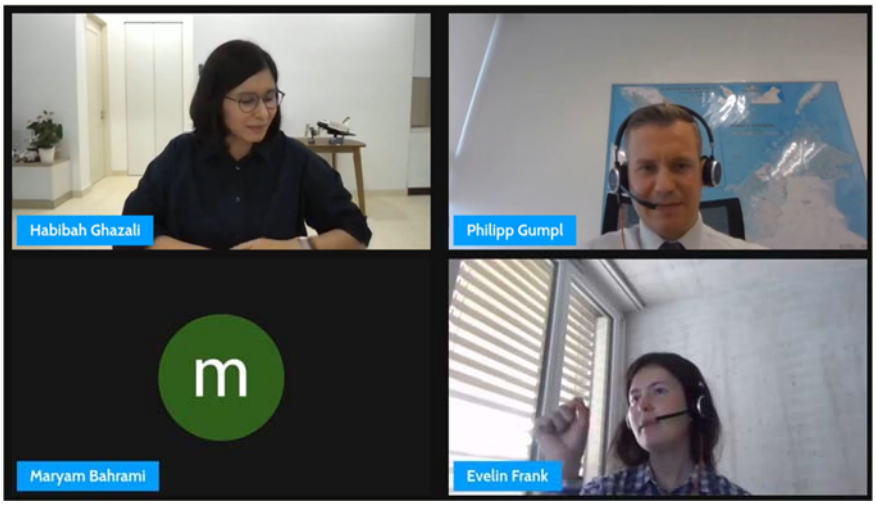

Figure 2: *Speakers and moderator during the sharing session*

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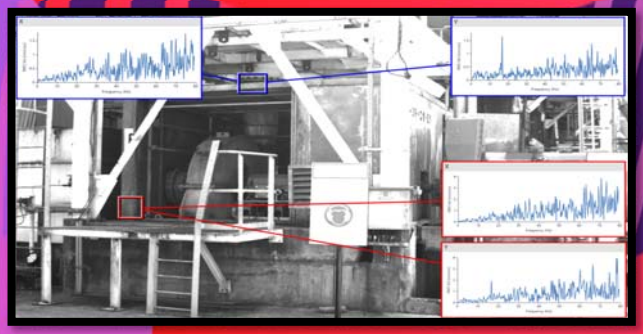
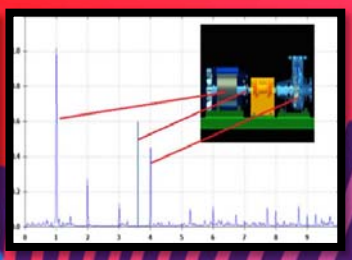
HIGHLIGHTS

- Advanced Vibration Troubleshooting on A Rotating Equipment.
- Application of FTIR Structural Analysis for Dried Coating Failure Investigation in Oil & Gas Industry.
- Utilization of Natural Fiber Towards Structural Applications Under Dynamic Loading Through MWCNT Enhanced Polymer Nanocomposite.





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