

# Roll-slip phenomenon of polymer composites: Online analysis assisted by computer vision

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Analyzing the wear mechanisms is performed using optical microscopy, SEM and TEM as a post-mortem analysis. However, the surface topography changes constantly as a function of time. Monitoring these changes elucidates interesting details on the wear process especially in complex contacts such as gears, rollers, cams. An online monitoring system using computer vision was developed to observe the surface changes in a twin-disc setup. The computer vision uses a high speed camera in conjunction with an optical microscope which is in focus on the monitoring surface. Two methods are followed to evaluate the wear process: 1. Blur detection and 2. Grey level estimation. Surface topography of the composite material was framed online at a relative high speed of 1.8 m/s. Online images acquired using computer vision confirmed the transformation of microstructure as a function of time. Images acquired at different instant where blurred due to the change in focus from the dimensional modification by wear. The blur of the image can be estimated which can serve as a variable to indicate the wear. Overlap between images helps to stitch the several images to form a surface which can be used to estimate the grey level caused due to the surface modification. Change in wear mechanisms like back transfer of resin to the composite surface is also observed using segmentation. Thus the missed out details in the post-mortem analysis can be clearly observed in the online monitoring for having a better understanding on the tribological characteristics.



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