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Manufacturing Processes form a Specific Application Field in Tribology

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Editorial

Extended papers from the 4th International Conference on Tribology in Manufacturing Processes are included in this special issue of wear (ICTMP 2010). The International Research Group on Tribology in Manufacturing has coordinated the fourth edition of the series (IRGTM). Which took place in Nice, France, from june 13 to 15, 2010, drew almost 2,000 participants. A group of 100 scientists from academia and industry will meet to address current issues. as well as current developments in the use of concepts and tools manufacturing tribology, *i.e.* shaping, assembling, and finishing metallic materials' surface engineering, with a particular emphasis on developing methods based on plasticity. Manufacturing processes are considered a distinct application topic in tribology by people who work in it. Basic tribological mechanisms are not dissimilar to those in other fields: wear mechanisms include abrasion, contact fatigue, heat fatigue, and so on. Work piece adhesion wear, galling, and seizure are all important stumbling blocks. To avoid them, lubrication, tool or work piece surface coatings, and surface engineering are utilised. The three classic lubrication regimes (boundary, hydrodynamic, and mixed) are well-known in this area. Contact circumstances, on the other hand, are rated differently. Contact pressure, sliding/rolling velocity, sliding length, and surface temperature, for example, are not always higher in ball bearings or piston-ring contact. What makes them unique is their combination, which can result in high contact conditions in specific operations. In wire drawing, the die slides hundreds of kilometres at speeds exceeding 10 ms^1 and at contact pressures that can approach 3 GPa in the last drawing passes of steel cord wire; it's no surprise that diamond is the best material for die core under such conditions hot forming (between 800 and 1300 degrees celsius for steel, for example) generates intense tribological conditions play a prominent role, and a complex one: some iron oxides are “lubricating”, others abrasive, depending on the temperature range. Another specificity is that such conditions (hundreds of MPa at least, tens of ms^{-1} in many cases, more or less high temperatures even in cold forming) are maintained on contact lengths ranging from a few mm to a few hundred mm. This enhances the risks of lubricant film breakdown, surface degradation, and seizure. Finally, one of the contact partners is in plastic, rather than elastic, deformation. This also increases seizure risks, as huge surfaces of fresh and reactive metal are created, in contact with the tool surface. In lubrication theory, the non-linearity brought by plasticity changes a lot the nature of the equations as well as the solution techniques, since the immense capacities of the theory of elasticity are lost "plasto-hydrodynamics" replaces elasto-hydrodynamic theory, which is significantly less advanced in terms of predictive and quantitative capability. These characteristics, which include often harsh conditions and the inherent difficulty of modelling, are the scientific issues at hand in the discipline. Traditional tribometers, as a result of these peculiarities, have long been known to fail to correctly rank technical alternatives, let alone measure a quantitatively adequate friction stress value. As a result, a variety of process-oriented tribological testing instruments and friction measurement systems have been developed. Varied processes have different contact conditions, which are also heterogeneous within each process. Different laboratory instruments are utilised to replicate the blankholder/blank/die in deep drawing, and tributesters are produced specifically for a given process or a given surface of contact in a process. Another rising trend is on-line measurement on production equipment themselves, which avoids the similarity issues that laboratory tests can cause. It can also be used to keep track of things. the procedure with regard to automatic control: for instance, continuous The amount or nature of the lubricant can be changed. Maintaining consistent friction in strip rolling is a crucial need. despite changing contact conditions in industrial operations (as a result of tool wear, speed transients, etc.) any observable that may be measured on a line, however, does not reflect friction isn't the only thing that causes plastic deformation. Models with a high level of sophistication are available. As a result, it’s critical to recover the friction stress without causing undue damage. uncertainty. Several driving forces keep the push on for change, for fresh answers to old or new issues. In an industrial setting, cost reduction necessitates enhanced productivity (*i.e*., higher speeds or larger reductions, resulting in more harsh conditions), as well as longer tool life and better surface quality. Micro-forming is a growing field that poses lubrication challenges, as friction is found to be length scale sensitive: this is primarily due to the ratio of workpiece dimensions to roughness wavelength, which governs the proportion of open/closed valleys, which controls lubricant movement and efficiency.

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