Keynote Speaker-------Prof. Nao-Aki Noda

Prof. Nao-Aki Noda, Kyushu Institute of Technology, Japan

Biography: Nao-Aki Noda received his Ph.D. degree in Mechanical Engineering from Kyushu University, Japan in 1984. He has been doing research and teaching at Kyushu Inst. Tech., Kitakyushu, Japan, 1984-87, He is an author of Theory of Elasticity useful for engineers and a co-author of Safety Engineering for Workers in Industry and other several books. He is a co-editor of Stress Intensity Factors Handbook, vol. 4 & 5, Advances in Finite Element Analysis for Computational Mechanics. He is a recipient of Outstanding Paper Medal of Japan Soc. Tech. Plasticity, Sokeizai Industry Technology award from the Materials Process Tech. Ctr., a fellow of JSME (Japan Soc. Mech. Engrs.) and a fellow of JSAE (Soc. Automotive Engrs. Japan). Achievements include researches in stress analysis for notched material testing specimens, and development for large ceramics structures used for steel manufacturing machinery.

Speech Title: Contact analysis and simulation of rolled plastic film used for roof ventilation in Japanese greenhouses

Abstract: Greenhouses are capable of producing a variety of high-value crops year-round. A novel Japanese greenhouse design is gaining popularity because of its automated roll-up ventilation system that is integrated into the roof. However, due to the frequent movement of the roll-up system, the plastic film deteriorates rapidly and typically lasts for only three or four months. Therefore, in this paper, the contact damage on the plastic film investigated considering the rolling contact analysis and experiment including the influence of pipe surface roughness. This study investigated the rolling contact damage in four types of plastic film used to cover automatically ventilated greenhouses. The mechanical damage under static and rolling contact was evaluated by FEM analysis. In addition, creases and line scars in the plastic film were generated by a newly designed rolling contact machine. The damage was also examined by microscopy techniques. We found that film deformation and failure were closely related to stretching and creasing, and these processes were observed at the microscopic level. An experimental device was developed to further study the damage to greenhouse film due to the roll-up movement. We concluded that film deformation and failure were closely related to the film thickness reduction, stretching, creasing and the roughness of the arch pipe. With decreasing the surface roughness by using coating pipe, the number of linear scars decreases by significantly.

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