



Recommendation of Supervisor

Supervisor's opinion on Ph.D. thesis of Mr. Hafiz Faisal Siddique, M.Sc.

His Ph.D. thesis is entitled " Tensile Characterization of Compression Sock's Ankle Cut-Strips and Development of Models to Approximate Laplace's Law ".

This dissertation is focused to analyze the engineering of commercially available compression socks and their therapeutic interaction to wooden leg. Therapeutic interaction was subscribed by analyzing the mechanism of exertion of interface pressure on the face of the leg. To analyze the mechanism of working, ankle cut strips were detached from the ankle position and tested for the tensile characterization. Tensile characteristic especially hysteresis, loading energy, unloading, tensile linearity and force at practical extension were compared to experimental pressure to estimate their level of significance. This research highlighted the appropriate missing parameters that can be incorporated in mathematical models for precise estimation of compression pressure. Latterly, using modelization technique, two developed models based on theory of true Young's modulus and engineering Young's modulus compared to Laplace's law, existing developed mathematical models and experimentally measured pressure results. Developed models can be used to estimate the interface pressure for any part of static object using elastic compression garments.

He used 13 socks samples of different brands belonging to three different compression class levels (compression class I, II and III). All socks sample were precisely analyzed for their physical, structural and tensile characteristics under controlled environmental conditions. Detachment of circular cut trips at ankle part was done by wearing on standard wooden leg and marked according to engrave grooved line. The experimental part of this dissertation is unique as very few studies exist in which the tensile characteristics are ever evaluated using uniaxial tensile teste instead of Kawabata evaluation system.

During his Ph.D., he validated his skill to execute high-quality research, with motivation and hard work. Naturally, he needed guidance, but once the goal was set, he performed very well



to reach goal. It is very pleasant for me to see him working on a high level of research that is valuable for venous ulcer patient's and compression garments manufacturers. During his research work period, he has been very punctual, discipline and followed the given instructions. He participated in all events (Ph.D. student days, conferences and SGS programs) organized by the department and FT, TUL.

He has published **17 articles** in highly impact factor journal, of which he is the first author in 12 articles. All published articles reflect the orientation related to his Ph.D. work. He completed part of his experimental work at Variteks Orthopedics and RMIT, Australia, where his co-supervisors were Okan Öztürkatalay (CEO of Variteks orthopedics) and Prof. Dr. Lijing Wang. With 4 years of industrial experience at the medical compression socks company, he utilized his skills perfectly for his research work at university.

Consequently, I strongly recommend Mr. hafiz Faisal Siddique's thesis to be accepted for defense.

Adnan
14.3.2023

Ing. Adnan Ahmed Mazari, PhD.

Supervisor