Nattha Duangphattra 2009: Determination of Appropriate Processing Conditions for Injection Molding and Properties of Polypropylene/Multiwall Carbon Nanotube Nanocomposites Using Experimental Design. Master of Engineering (Industrial Engineering), Major Field: Industrial Engineering, Department of Industrial Engineering. Thesis Advisor: Mr. Chuckaphun Aramphongphun, Ph.D. 134 pages.

This research work studies the effects of processing conditions on mechanical properties of polymer nanocomposites. Polypropylene (PP) nanocomposites reinforced with 0.5 and 2.5 %wt multiwall carbon nanotubes (MWCNTs) were prepared via melt compounding and formed by injection molding. The 2^k Full Factorial design was used to plan the experiments and determine the influences of the processing conditions on mechanical properties and carbon nanotube dispersion in the nanocomposite. These conditions consist of five factors: (a) %wt content of MWCNTs: 0.5 and 2.5 %wt, (b) barrel temperature: 190 and 220 $^{\circ}$C, (c) injection velocity: 25 and 45 mm/sec, (d) screw rotational speed: 75 and 227 rpm and (e) holding pressure: 45 and 65 bar while injection pressure and cooling time were set at 75 bar and 50 sec, respectively, for all conditions.

Young's modulus and tensile strength of the samples were examined by using a Universal Testing Machine (UTM). In addition, Scanning Electron Microscopy (SEM) was applied to study the dispersion of carbon nanotubes in the nanocomposite. The results showed that PP/MWCNT nanocomposites had Young's modulus of 1,732 MPa and tensile strength of 34 MPa while original PP had 1,450 MPa and 28 MPa, respectively. Therefore, the mechanical properties were improved significantly with the content of MWCNTs. Full Factorial experiments investigate that significant factors are %wt, barrel temperature, injection velocity, and screw rotational speed. Moreover, SEM showed that MWCNTs dispersed well in the test specimen.

_____ _____ ___ / ___ / ___

Student's signature Thesis Advisor's signature