inital analytical work conducted in this area, and is the forerunner of the efforts presented herein. Several short articles, References (f), (g), (h), and (i), have appeared which present a simplified analytical discussion of the pressure distributions in opposed anvil systems. However, in each of these, the assumptions of rigid anvils, one-dimensional variations, pseudo-type materials, zero anvil friction, etc., were invoked at will in order to reduce the equations to an easily tractable form. The complexity of the problem prohibits the thought of abandoning the experimental approach; nevertheless, these efforts would be complimented with an analysis based on the appropriate equations contained in the theory of plasticity. This thesis presents a completely analytical solution for the compression of wafers under elastically deformable anvils, with due consideration given to the parameters listed above. A theoretically compatible experimental model has been developed and employed in an effort to assess the significance of the required mathematical assumptions, and to verify the resulting pressure gradients. The specific contribution of this thesis is the ability to examine, on an individual basis, both analytically and experimentally, the effects and influence of the parameters itemized in the previous paragraph. Several special cases have been treated to illustrate the scope and flexibility of this analysis. It is to be noted that the results of this thesis are in basic agreement with the conclusions of References (b), (c), and (j), and can be used, with the more exact definition