A Tribological Study of The Optimization of Pizza Making

Gordon Krauss, Miranda Brandt, Leilani Elkaslasy, Kanoa Parker

Introduction:

Pizza makers have consistently faced a challenge when dusting pizza dough with flour. Too much flour and the pizza burns in the oven, not enough and the dough does not slide off the peel. To find the answer to this dilemma varying amounts of flour were added to pizza dough and the effect on the dough's ability to slide on a surface effectively was examined. Through this, an optimum ratio of semolina flour to pizza dough was determined in order to give pizza makers everywhere a reliable measurement of flour they could use to overcome friction without inducing burning.

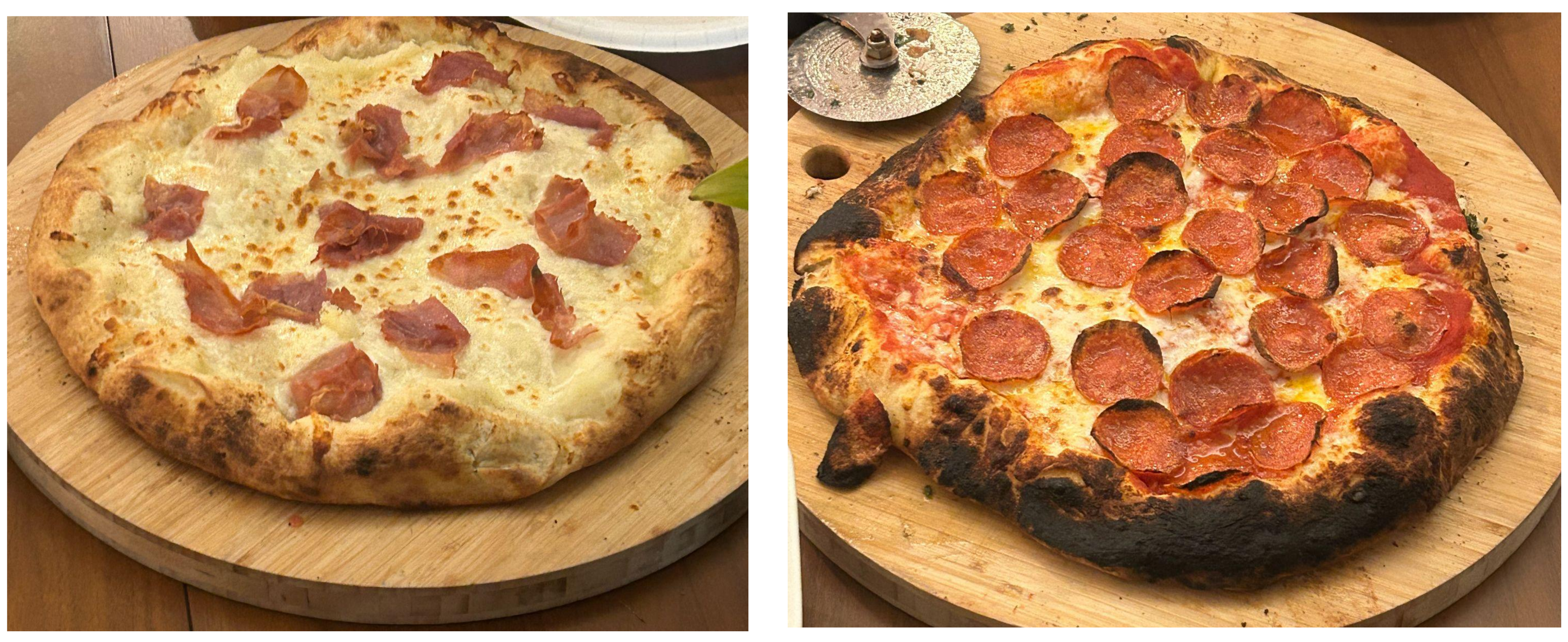

Figure 1: Pizza of the left was baked with an optimal amount of semolina and came out with a golden crust, the Pizza on the right was baked with too much semolina and burned in the oven.

Background:

Semolina flour was chosen due to its ability to reduce sticking to the pizza peel. This flour also absorbs a lot of water, which contributes to a denser, crunchy crust on the pizza.

Materials:

Figure 2: Materials Used: (left) Semolina finely ground (center) Semolina coarse ground and (right) Trader Joe's Garlic and Herb Pizza Dough

Methods:

After rising for the recommended half hour, dough was divided into clusters of even weight. Using a stencil, each piece of the dough was shaped into identical circles, and placed into a plate of semolina. The dough was then reweighed, to determine the ratio of semolina to dough. The weight of the risen dough was recorded before and after adding the semolina. The team placed each portion of dough onto a pizza tray, and recorded the angle the pizza began to slide using a digital protractor, seen in Figure 3. The testing was repeated with large and fine grain semolina and a wooden and metal pizza trays, and the coefficient of static friction was calculated using the angle of the peel and gravity .

Figure 3: Process to record angle of dough sliding

Results:

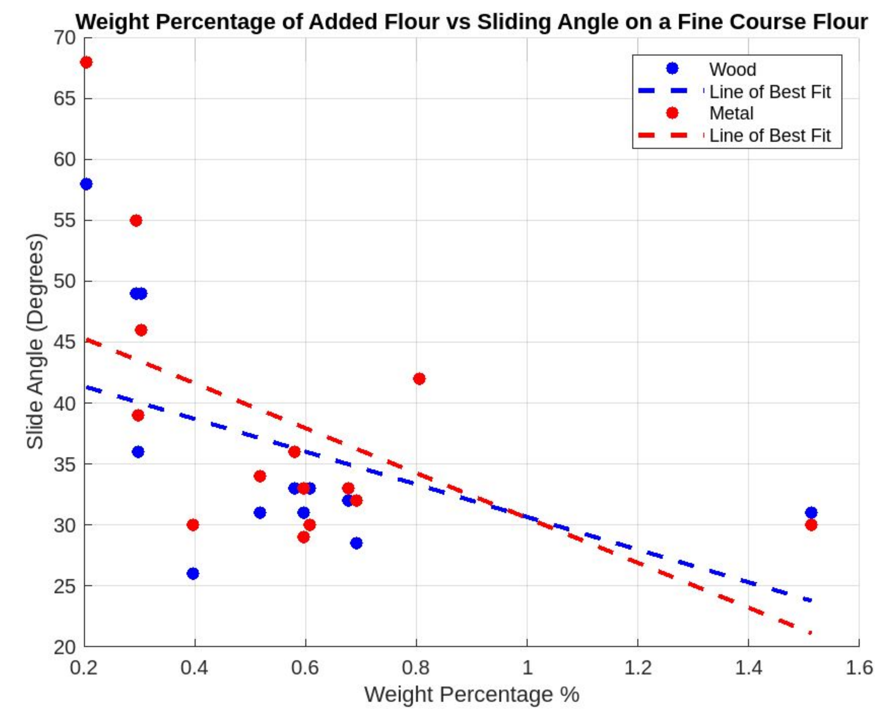

Figure 4: Negative correlation between weight % of added flour and friction course semolina

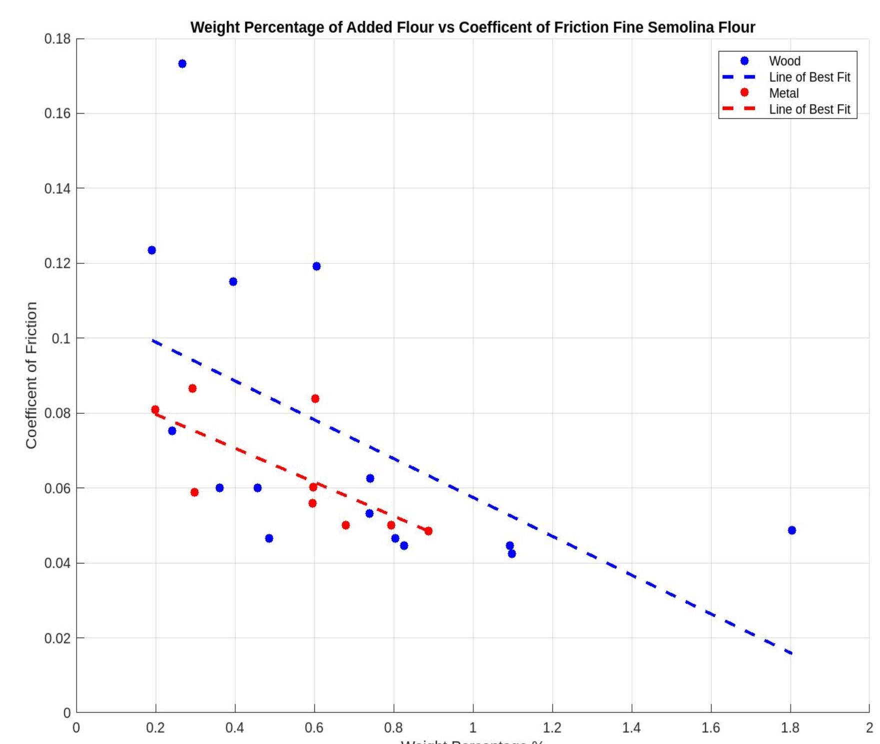

Figure 5: Negative correlation between weight % of added flour and friction of fine semolina

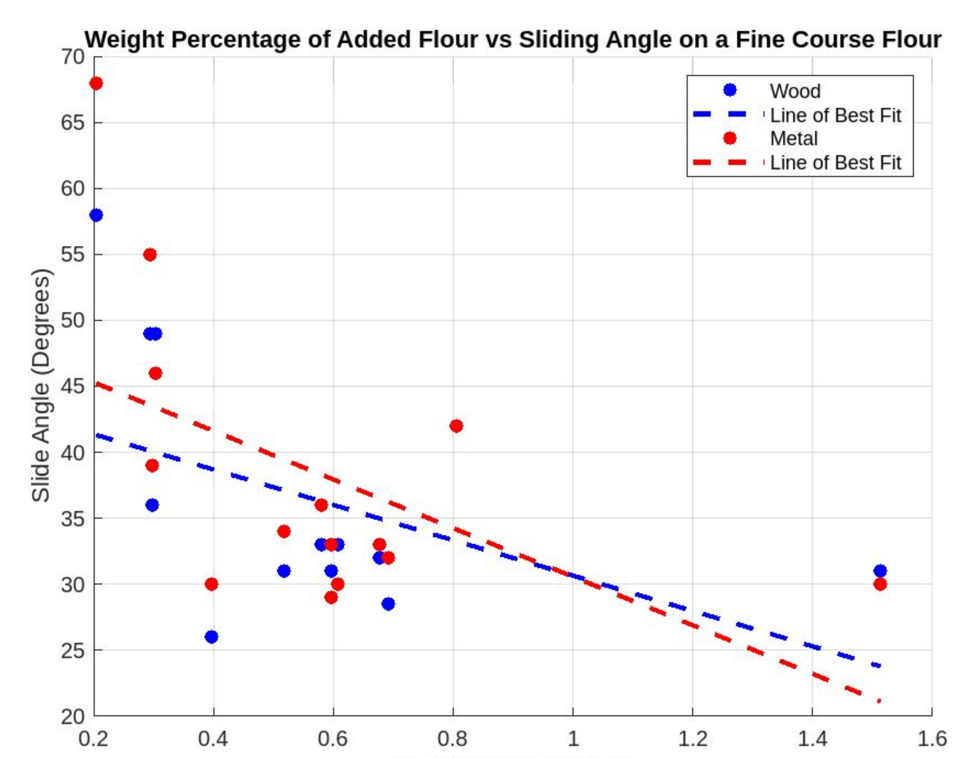

Figure 6: Negative correlation between weight % of added course semolina and sliding angle

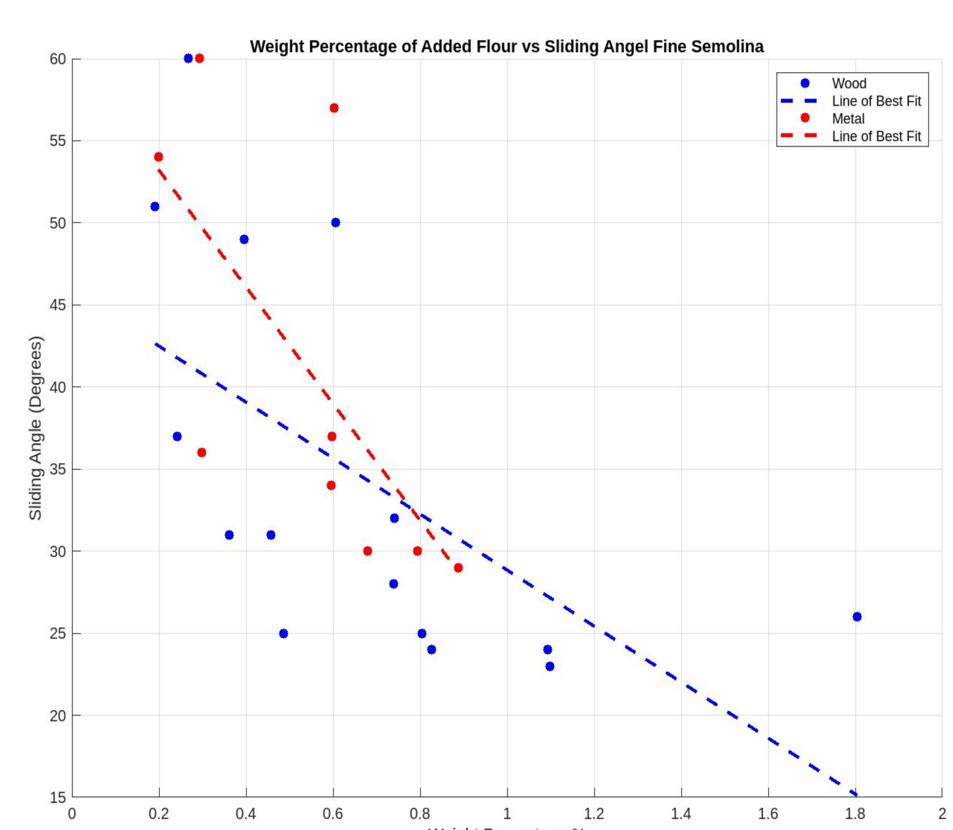

Figure 7: Negative correlation between weight % of added fine semolina and sliding angle

Conclusion and Future works:

Based on the results, the optimal amount of semolina by weight percentage for coarsely ground semolina on a wooden peel was 0.4%, as the sliding angle plateaued at about 25 degrees as semolina increased. (Figure 7) For all other testing configurations results were inconclusive although informative. For coarsely ground Semolina on a metal peel 0.7% was where the angle of sliding began to lower at 30 degrees. For finely ground semolina on a wooden peel the optimal weight percentage was found to be .5% at which sliding angle fell between 30 and 35 degrees thereafter. Finally, for finely ground semolina on a metal peel optimal weight percentage was also found to be .5 % after which sliding angle fell approximately between 28 and 36 degrees.

In the future, conducting more tests and collecting more data points could help determine a more linear relationship between semolina and help mitigate the effects of random error. These conclusions can now act as guidelines for pizza makers as the navigate the finicky nature of semolina ratios and burnt crusts.