RSM are to confirm observed or assumed effects in the variable selection stage and quantify the most appropriate values for the parameters under study to optimize the response. Finally, the predicted optimum must be verified after model building and optimization.

3.1. Box Behnken Design of Experiment

Box Behnken DoE aims to find the effects of factors, estimate the curvature or quadratic effects, and determine the most appropriate values for the parameters under study to find the response surface and minimize the required set of experiments. The influences of solid loading, acid-oxidative hydrolysis temperature, and time on delignification efficiency and solid fraction yield were evaluated using full factorial design in Minitab 17 software. Mathematical matrices will be constructed within the ranges of the chosen variables. The three independent variables have three levels (-1, 0, and +1; **Table 1**) and three central points, leading to 15 combinations (**Table 2**). The severity factor calculated from the time and temperature conditions is included in **Table 2**. Apart from the combinations arising from the Box & Behnken Design, the hydrolysis conditions with sulfuric acid were carried out for comparison. The experiments carried out to extend the analysis of the temperature influence are indicated in **Table 2**.

Table 1: Levels of factors tested in the Box and Behnken Design of Experiments for optimizing LCW delignification.

Factors	Levels		
	-1	0	1
Time (min)	30	60	90
Temperature (°C)	70	80	90
Solid Loading (g/ 20mL liquid)	5	10	15