

## ABSTRACT

Athmanathan, Arun. M.S.E, Purdue University, West Lafayette, December, 2008. A Study of Ethanol Impact on Xylose Fermentation in *S. cerevisiae* 424A (LNH-ST). Major Professor: Nathan Mosier.

Ethanol cytotoxicity, due to its permeabilizing effect on cell membranes, is a significant bottleneck in industrial fermentation. To understand ethanol impact on xylose fermentation, batch fermentations were carried out using *S. cerevisiae* 424A (LNH-ST), an engineered strain capable of co-fermenting glucose and xylose. The fermentations were carried out in YEP growth media, using cells pre-grown aerobically to  $OD_{600} = 400$  K.U in the presence of ethanol (2 - 9% w/v). Using concentration data gathered periodically through the process, the effects of extraneously added “shock” ethanol and ethanol gradually generated from glucose equivalent (co-fermentation) were compared. Yeast was found to cease fermentation at an ethanol concentration of 9% (w/v) in case of ethanol shock, but was capable of continuing up to a concentration of 12% (w/v) when ethanol was gradually generated. Fitting preliminary xylose consumption rates (linear slopes) and ethanol concentrations to a Levenspiel inhibition curve yielded maximum consumption rate and tolerable ethanol concentration, allowing the development of a modified Monod kinetic model for ethanol fermentation from xylose in *S. cerevisiae* 424A (LNH-ST).