VERTECBIO 5516 CLEANING SOLVENT

INITIAL PRODUCTION EVALUATION

The initial Production evaluation of VertecBio 5516 corn-based cleaning solvent as a potential replacement for n-methyl-2-pyrrolidone (NMP) was conducted on July 16, 2003. Jim Opre, president of Vertec Biosolvents, Inc., was in attendance to observe and advise during this scale-up trial. Results were extremely encouraging!

The first phase of our evaluation involved spray washing Reactor 10 with a hand-held wand following the manufacture of a batch of RN-1513RH. Prior to applying the solvent, the vessel walls were coated with residual RN-1513RH over an underlying layer of brownish, gelled urethane that had accumulated over time due to the inefficiency of the current NMP cleaning process. The following photo illustrates this condition.

A brief spray washing with VertecBio 5516 easily and completely removed the residual fresh RN-1513RH, but left the underlying layer of gelled material still on the sidewalls. At this point, the GB Mills Pressure Washing unit was charged with VertecBio 5516 and hooked up to Reactor 10. Following 1 ½ wash cycles (at 15 minutes per cycle), the bottom drain plugged off with chunks of gelled urethane that had been loosened from the vessel walls by the solvent spray, causing the wash unit to shut down due to inadequate return flow. The pool of VertecBio 5516 that had accumulated in the bottom of the reactor was vacuum transferred to Reactor 15. Following the transfer, Reactor 10 was re-examined. As evidenced by the next two photos, this very short period of pressure washing had effectively removed the gelled urethane that had coated the vessel walls

(with the exception of one small area about 1' x 1.5' that had approximately a half inch thickness of gelled material covering it). Even the dome of the reactor, which is typically the most difficult to clean, was spotless. Note that in the first photo, the brown chunks on the bottom of the reactor are loose pieces of gel that will be flushed out the drain valve.

It is safe to say that we were very pleased with this initial evaluation. We are in the process of pressure washing Reactor 15 at the present time, and will continue the clean-up process to bring all of our reactors back to the required cleanliness level. We feel that once this is accomplished, we will be able to maintain our vessels properly through the use of VertecBio 5516 cleaning solvent.