EXECUTIVE SUMMARY: MNVAP is researching the application of a Kinetic Disintegration System ("KDS") to biomass pellet production. The biomass pellets can then be more efficiently transported, stored and utilized for the generation of power in facilities that cannot accommodate raw biomass as a feedstock. The KDS technology is capable of handling a wide variety of feedstocks that have varying levels of moisture. In previous milestones MNVAP had conducted initial tests of the KDS to determine baseline performance and prepared a flow diagram for a complete system analysis.

In milestone #3 MNVAP has designed, fabricated and integrated the shredding and grinding system that will process the biomass so that the material fed into the KDS is the proper consistency. Included in the design were emission containment components to capture dust and particulates emitted in the process. System fabrication conducted on the airlock enabled better control of refuge dust generation. Activities from this milestone were necessary to begin the development of a commercial scale system to gain knowledge regarding operating specifications of the KDS so that this technology can be accessed as a feasible alternative method for the processing of a biomass feedstock.

MNVAP completed preconditioning requirements along with design and fabrication prior to the testing of an operational KDS. The KDS was operational by July 1, 2011. Permanent installation of the KDS and discharge material handling equipment would occur if biomass testing results are successful with an operational KDS. Emissions containment for test purposes only was approved by MPCA to gather required data for KDS evaluation. Design and integration of the shredding and
grinding system enables material processing data collection information to be obtained during the next milestones to identify functionality and feasibility of the KDS a method to process biomass for pellet manufacturing.

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**TECHNICAL PROGRESS:** Equipment to begin processing raw biomass fibers use in the KDS was designed, fabricated and installed. A new Radar brand airlock was installed on the bottom of the cyclone exiting the KDS to improve dust emissions. Another new Radar airlock was installed on top of the KDS to help improve chopping and sizing of the larger particles. Electrical for the system was fully functional with dust emissions containment in place. Designs from AMEC were engineered so that MNVAP could allow the KDS to assist in the processing with the current pellet manufacturing process. Photo 3 shows refuge dust escaping from the airlock prior to the installation of a new Radar airlock to improve dust emissions containment. As a temporary fix, two bag house socks were used to contain dust emissions of the vent ports of the KDS. A belt conveyor was rented to temporarily feed biomass into the KDS. A permanent conveyor is being built as part of the new design. For initial operational tests of the KDS machine, biomass was fed onto the conveyor by pitch forking hay by hand. When complete, the conveyor would be fed using a front-end loader. The processed biomass was stored in 8 bulk storage totes within the hoop shed.

A hoop style shed was constructed to house the KDS machine and auxiliary conveyors required to transfer test biomass material to the KDS for evaluation. The “hoop shed” is approximately 54 feet wide and 62 feet long and 30 feet high. Photos 1 and 2 provide a visual of the hoop shed that was constructed along with processing equipment that was installed. The design and integration of the shredding and grinding system enables material processing data collection information to be obtained at a test level to identify functionality and feasibility of the KDS.

**ADDITIONAL MILESTONES:** Milestone 4 was started with the purchase of a conveyor to feed the KDS system. Designs from AMEC were finalized to incorporate the KDS system with the current processing.

**PROJECT STATUS:** The project looks very good due to many hours of critical analysis. The design and integration of the shredding and grinding system enables material processing data collection information to be obtained at a test level to identify functionality and feasibility of the KDS system. System fabrication conducted on the airlock enabled better control on refuge dust generation.
APPENDIX:

Photo 1 Operational KDS system in hoop building
Photo 2 Material discharge from KDS system
Photo 3 Material discharge prior to installing Radar brand airlock

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Photo 1 – Operational KDS system in hoop building

Photo 2 – Material discharge from KDS system

Emissions/dust collection

Functioning electrical control panel

Airlock for dust control

Emissions/dust collection
Photo 3 – Material discharge prior to installing RADER brand airlock