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FINITE ELEMENTS ANALYSIS OF HORIZONTAL VESSEL

PROBLEM DESCRIPTION:

The horizontal reactor vessel (21.5' dia. x 42' T/T) is going to be subjected to additional catalyst loading of 60,000 lbs. The engineering calculations by conventional methods (ZICK ANALYSIS) show higher than allowable stresses near the saddles. As a result of this overstressing, additional stiffener is required in addition to the two stiffeners already present. To avoid the expense of excessive welding on large diameter stainless steel vessel, it is required to evaluate the structural integrity of the vessel using Finite Element Analysis.

RESULTS:

The Finite elements analysis was performed using FEA software ANSYS.

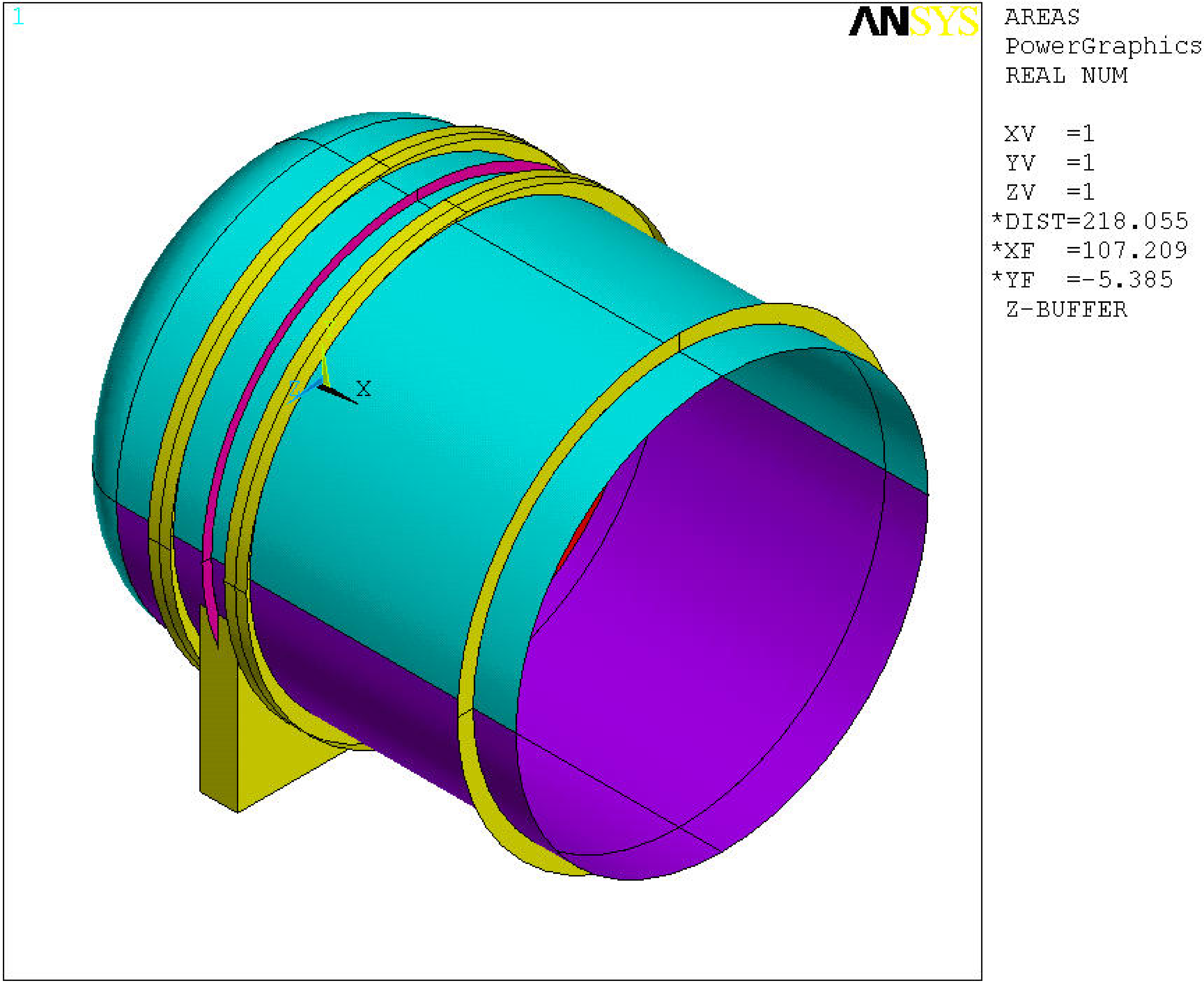
The vessel was analyzed for self weight, loading from catalyst and other internals along with internal and external design pressure present in the vessel.

Two different types of finite element models were used for analysis of the horizontal reactor vessel. One is a half model representing one half of the vessel and one saddle. This model also had the additional stiffener ring (1"x 6" flat bar). The other model represents the full vessel along with both the saddles.

Several different cases of these models were run to perform the analysis. Based on the results for different loading combinations, it was concluded that all the stresses in the vessel are within the code allowable stress limits and the current vessel design is acceptable for the additional loading specified for the vessel without any additional stiffener rings.

The cost saving as a result of this conclusion becomes two fold as there were two such horizontal reactor vessels in the plant experiencing the same issues.

The attached FEA plots show the model and results for two of the cases analyzed.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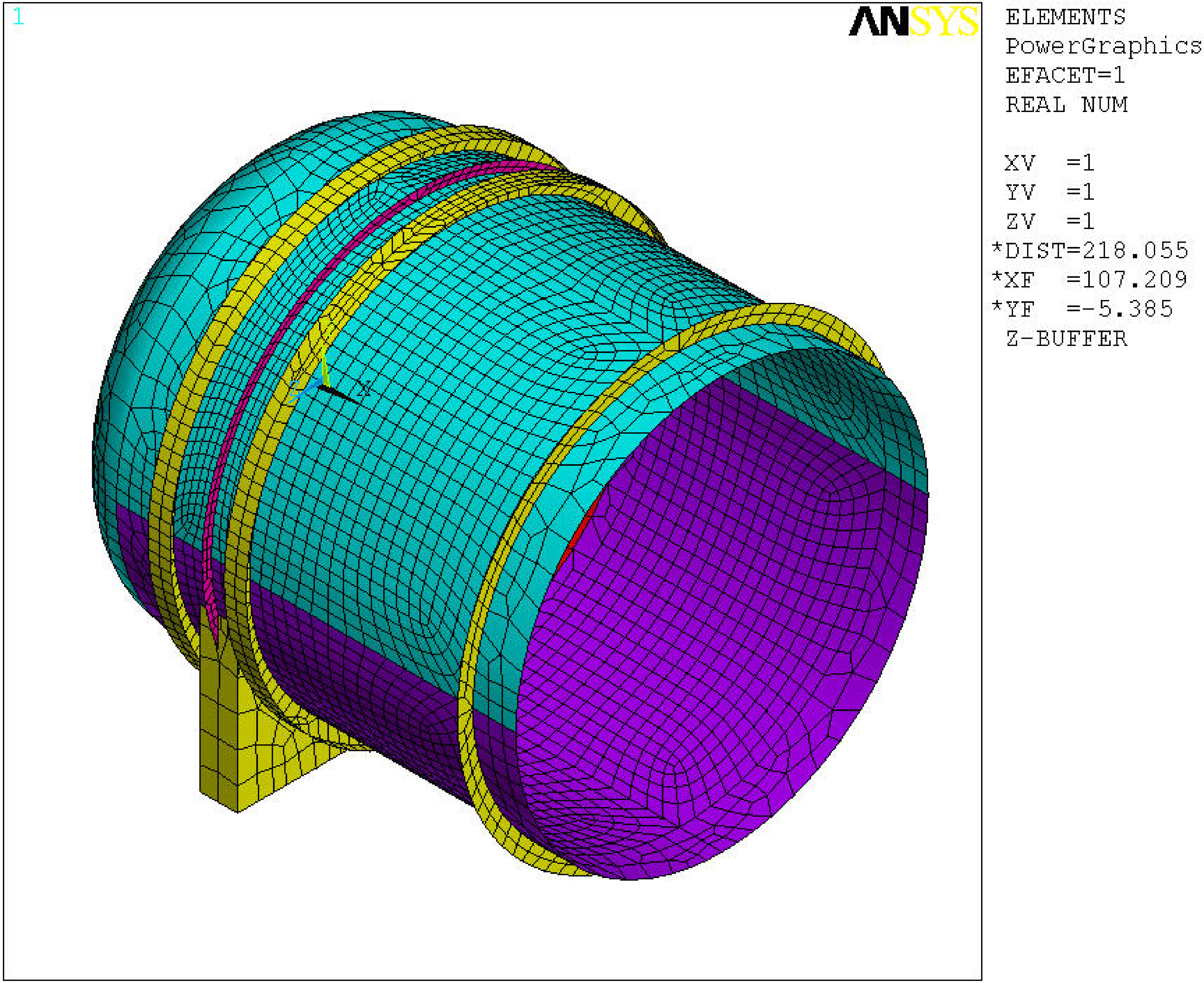
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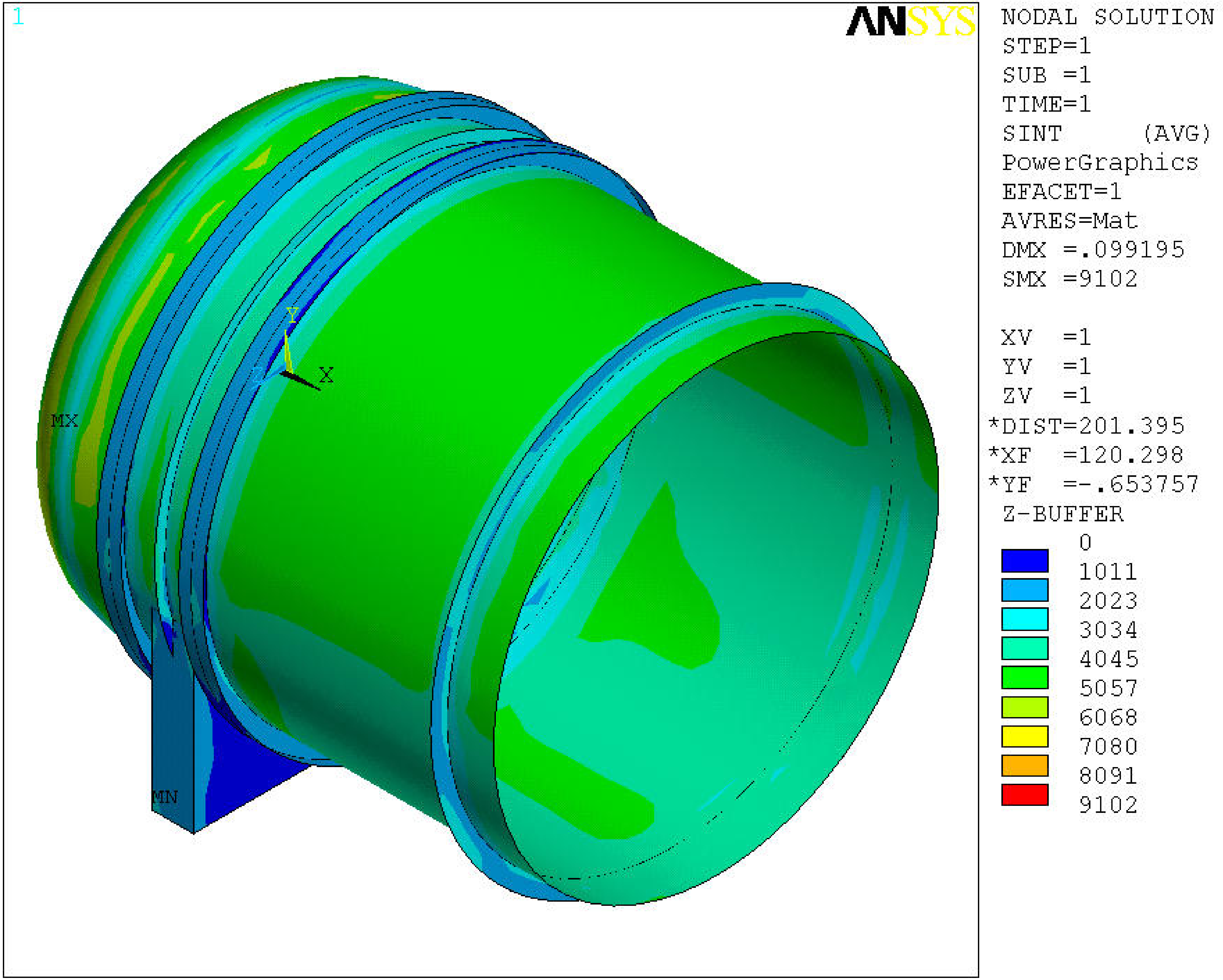
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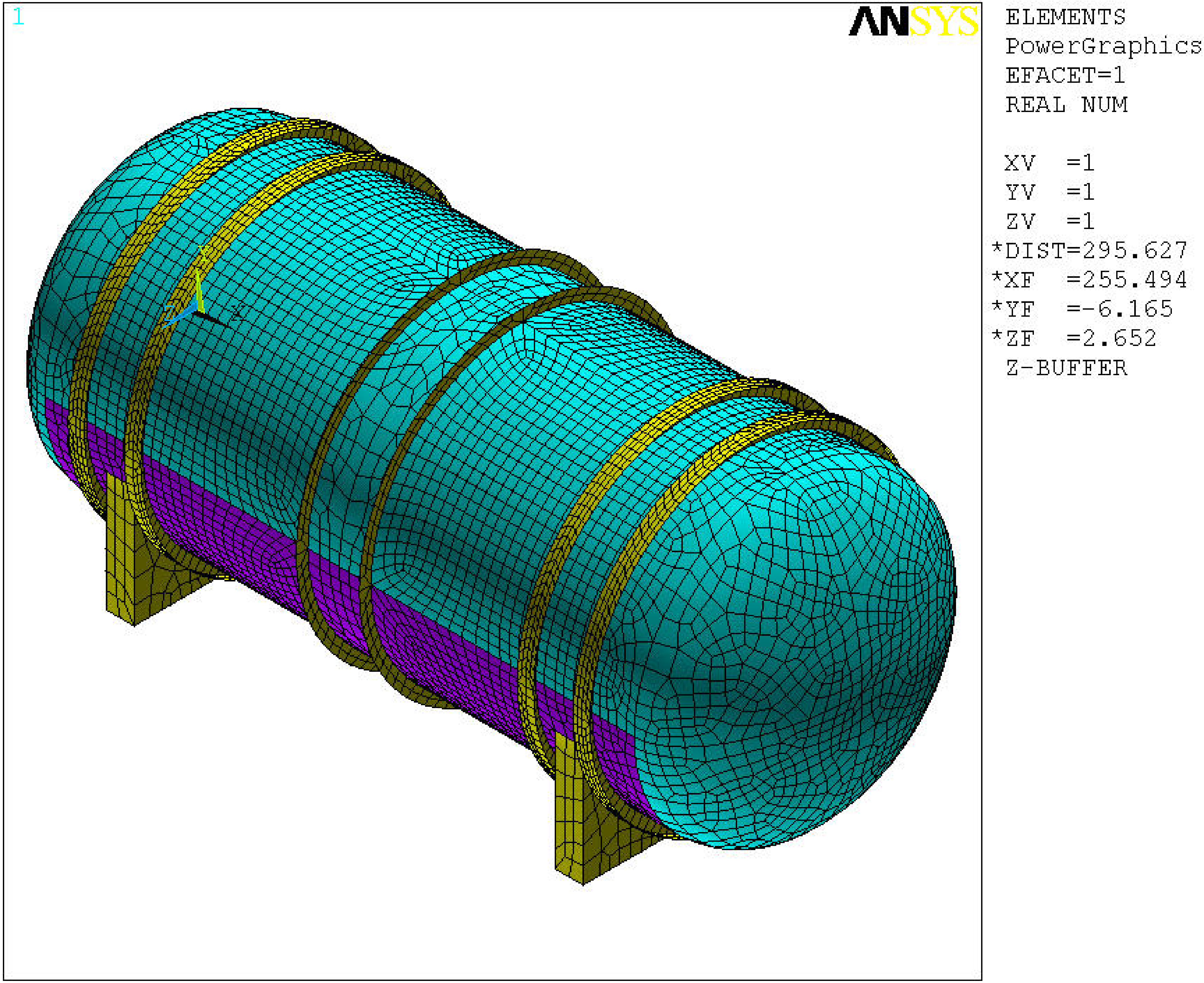
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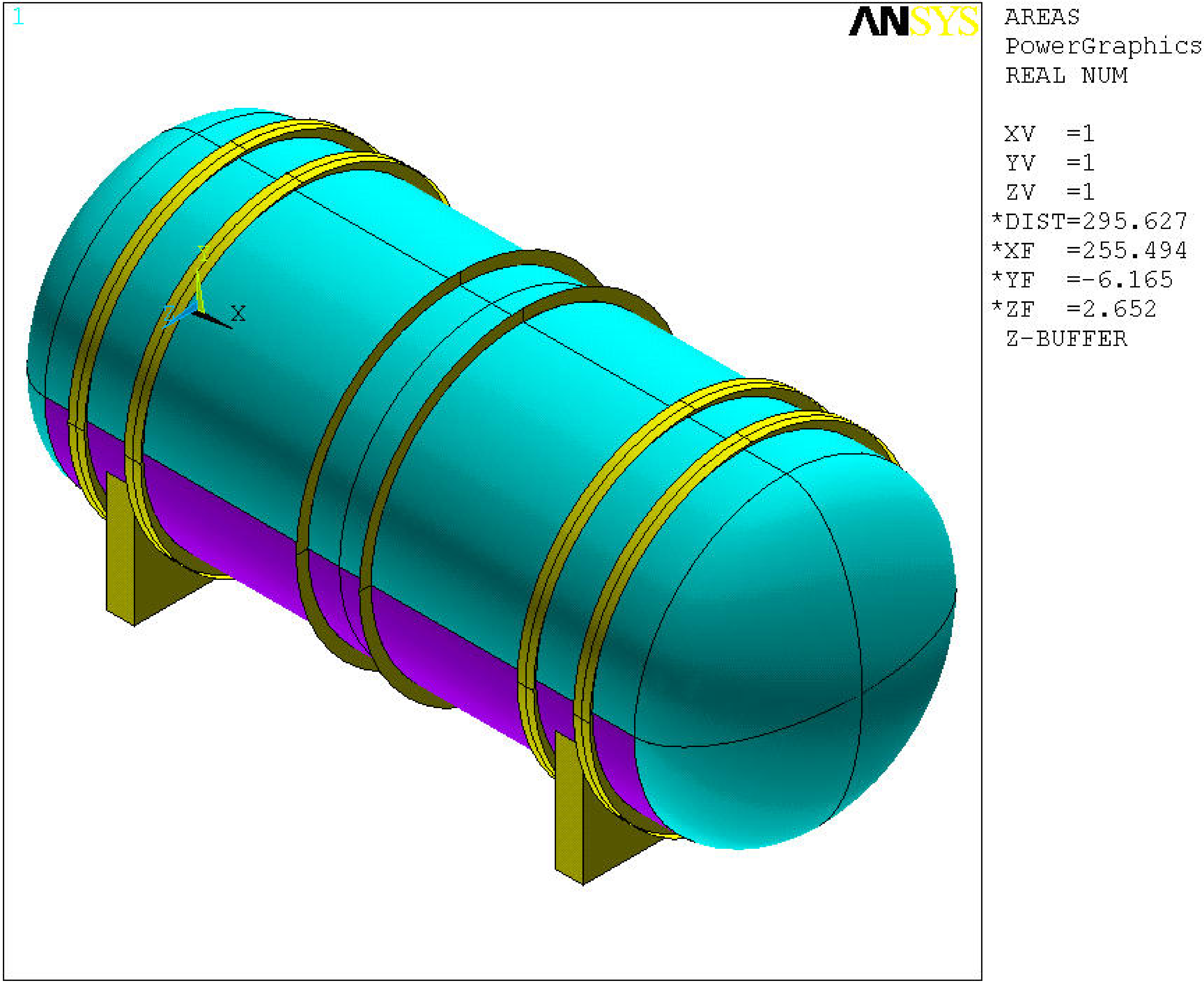
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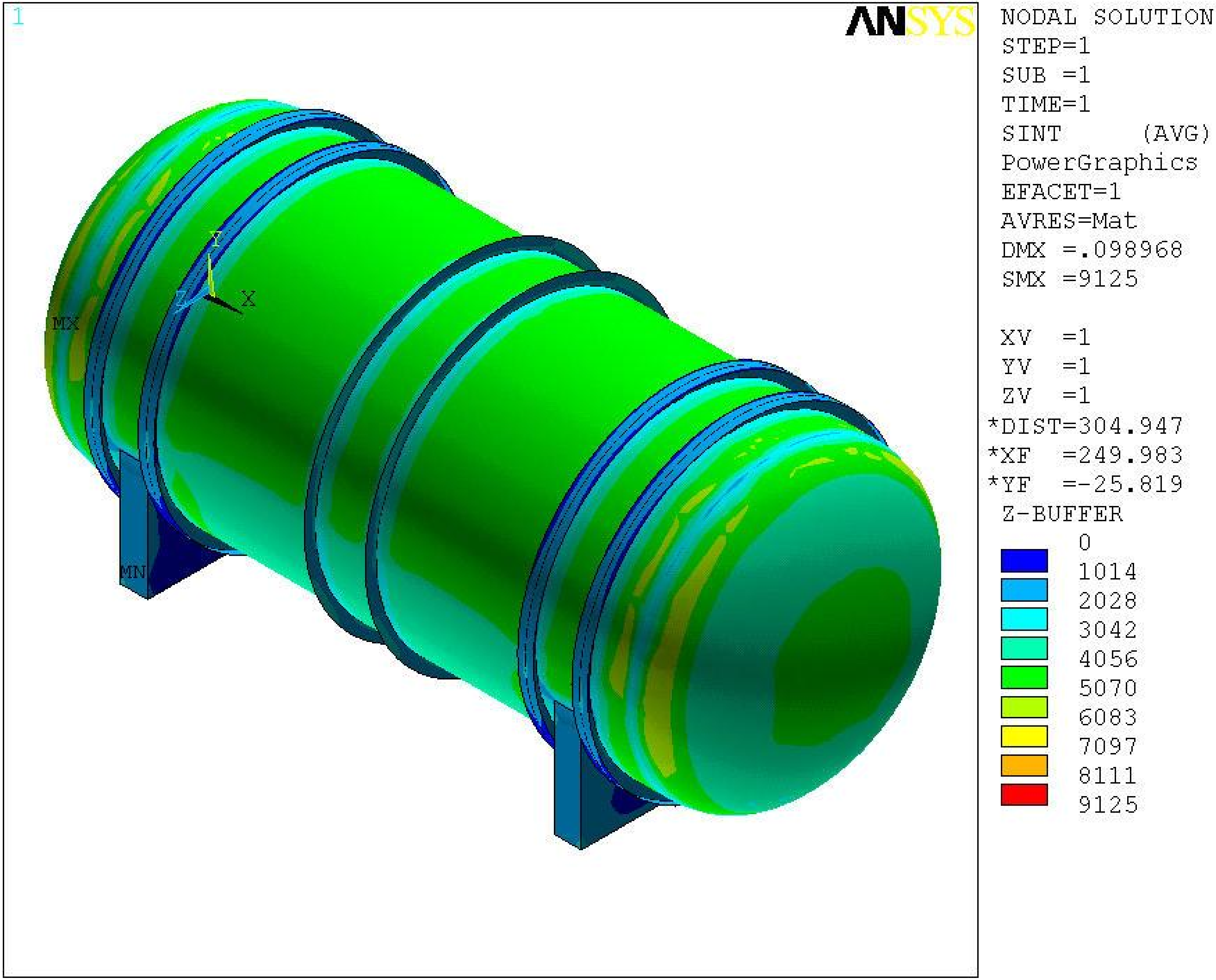
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