Quarterly Management Report

WBS Element	Project Title	Contract Number	Contract Start	Contract End
INEEL-2	INFLUENCE OF PROCESSING ON MICROSTRUCTURE AND PROPERTIES OF IRON ALUMINIDES AND COATINGS		10/01/85	09/30/04

Performer Name and Address	Principal Investigator(s)
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BUDGET AND COST REPORT

Prior Year Funds [$K]	60
Total Current Year Commitment $K]	230
Projected Current Year Costs [$K]	220

	O	N	D	J	F	M	A	M	J	J	A	S
Planned Costs	18	24	54	99	114	129	144	159	174	189	204	220
Actual Costs	18	24	54									
Variance	0	0	0	99	114	129	144	159	174	189	204	220

MILESTONE REPORT

Milestone Designation	Milestone Description	Due Date	Revised Due Date	Completion Date
INEEL-2-1	Relate Thermal Spray Parameters to Microstructure, Stress and Oxidation Behavior of FeAl Coatings	11/30/03		11/30/03
INEEL-2-2	Mo Silicide Coating Process Development	09/30/04		
INEEL-2-3	Determine Effects of Microstructure and Residual Stress on Coating Performance for Fe3Al Alloys	09/05/04		
INEEL-2-4	Determine Effects of Microstructure and Residual Stress on Coating Performance for FeAl Alloys	09/05/04		

TECHNICAL HIGHLIGHTS

Thermal cycling experiments have shown that minimum total residual stress gives rise to the best coating performance in thermal cycling in an oxidizing environment. This is in contact with a commonly held belief in the industry that compressive stress yields better performance. Large compressive stresses correlate with coating failure by fracture and spallation between coating layers parallel to the substrate/coating interface. Coatings with large tensile stresses also fail after relatively few thermal cycles; however, the failure in these coatings occurs by debonding of the coating from the substrate. Numerical simulation of brittle materials, as the iron aluminides tend to be in the thermal spray coatings, has indicated that large compressive stresses in the plane of the coating can in fact give rise to cracking parallel to the interface. It is not likely that such a failure mechanism would be observed for ductile compositions. It is probably significant for most classes of coatings designed for high temperature coal combustion conditions.

Stresses during thermal cycling are largely a result of differences in coefficient of thermal expansion. The low residual stress coatings also tend to have lower compliance due to some porosity. This may also affect coating performance. We intend to investigate the individual contributions of stress and porosity as part of the coating performance evaluation that includes mechanical properties of the coating and strain to failure of the coating/substrate couple.

ISSUES

The $60K carry-over from FY03 includes $30K un-costed obligation for a TGA system; this will be costed in January 2004.

Report Prepared By	Date
Richard N. Wright	01/30/04