

**State of Wisconsin/Department of Transportation**  
**RESEARCH PROGRESS REPORT FOR THE QUARTER ENDING:**

<b>Program: TPF-5(092)</b>	<b>FHWA Pooled Fund Research Program</b>
<b>Project Title:</b> Development of Standardized Test Procedures for Carbide Insert Snowplow Blade Wear	
<b>Project ID:</b> 0092-08-31	
<b>Administrative Contact:</b> Mike Sproul	<b>Sponsor:</b> Clear Roads Pooled Fund
<b>WisDOT Technical Contact:</b> Kim Linsenmayer	<b>Approved Starting Date:</b> October 15, 2007
<b>Project Investigator (agency &amp; contact):</b> Braun Intertec Corporation, Cameron Kruse	<b>Approved Ending Date:</b> July 1, 2009

**Percent complete (budget and hours):**

- **Hours and budget expended to date:**                      Hours = 45%      Budget = 49%
- **Hours and budget expended for current quarter:**      Hours = 2%      Budget = 2%
- **Hours and budget balance:**                                      Hours = 55%      Budget = 51%

**Brief project description:**

Carbide inserts of snowplow blades fail through wear (abrasion) and through durability (fracture). This research project will (Task 1) identify test procedures that have potential to predict the wear and durability performance of the carbide inserts. The most promising test procedures will be developed in the laboratory (Tasks 2 and 3) and compared to the performance of identical sample carbide inserts measured in field tests of actual snowplowing (Task 4). The results of the laboratory and field tests will be analyzed to determine the effectiveness of the tests at predicting performance of the carbide inserts (Task 5). The final deliverable is a report that documents the testing and provides recommendations for use of the test procedures and for additional studies, if needed.

**Progress this quarter (include specific tasks completed):**

Progress this quarter has been very limited by the lack of the samples of carbide inserts for testing. We are waiting for delivery of the samples from the third supplier (we have samples from two suppliers).

We have accomplished parts of Task 2 in the laboratory using worn blades we acquired from Hennepin County, MN. We also acquired samples of just the inserts from one of the blade suppliers which we may be able to use in Task 2 when the remaining samples arrive.

We have acquired the “Scratch Test” equipment from Iowa Institute for Hydraulics and have purchased a microscope of greater power, as recommended by the previous research with this equipment.

We have conducted tests to evaluate the influence of temperature of the inserts during fracture. We conducted a modified impact test (ASTM E23 Notched Bar Impact Tests of Metallic Materials) in an environmental chamber at three different temperatures. The data was not helpful in determining the influence of temperature but further research of information on carbide inserts indicates there will not be a ductile to brittle transformation as a result of temperature changes within the range of temperatures anticipated in actual snow plowing service.

Tests which are still under consideration in Task 2 include:

- ASTM B294 Hardness Testing of Cemented Carbides
- ASTM B390 Recommended Practice for Evaluating Apparent Grain Size and Distribtuion of Cemented Tungsten Carbides
- ASTM B276 Apparent Porosity in Cemented Carbides
- ASTM B611 Standard Test Method for Abrasive Wear Resistance of Cemented Carbides
- ASTM B311 Test for Density of Cemented Carbides
- Impurities will be determined by a qualitative chemical analysis performed by energy dispersive x-ray spectroscopy (EDS). This will result in a specification of a maximum composition of all other metallic elements
- “Scratch Test”

**Tasks planned for next quarter:**

Assuming the third set of blades is received we will complete the Task 2 development of laboratory test procedures and complete the laboratory testing of Task 3. We will also direct the field testing of Task 4, to be conducted by the Utah DOT. If the blades are received early in the quarter we will be able to complete the testing and begin preparation of the draft report (Task 5).

At the completion of the evaluation of Task 2 we will provide our evaluation and recommendations for the tests to be compared to field testing. We will ask the TAC panel to provide feedback on our analysis and recommendations.

**Identify any outstanding issues and barriers**

The single barrier is the lack of test samples. We are waiting for the blade inserts from the third supplier. We understand they were ordered by the Utah DOT in June but have not yet been delivered.

**Please attach Gantt chart.**

See next page.

Timetable for Development of Standardized Test Procedures for Carbide Insert Snowplow Blade Wear

Tasks	'07			'08			'09															
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	
Task 1. Comprehensive Literature Search																						
Task 2. Development of Standardized Tests																						
Task 3. Laboratory Testing																						
Task 4. Field Testing																						
Task 5. Analysis and Reporting																						
<b>Deliverables</b>																						
Quarterly Progress Reports																						
Teleconference with TAC																						
Draft Final Report																						
Meeting with TAC to discuss report																						
Final Report																						
Implementation Plan																						

Black shading indicates original schedule. Yellow shading indicates current estimated schedule.