**APC project meeting – September 14, 2012**

Amino N.A.C., St Thomas, ON

11:00 – 16:30

**Meeting participants:**

Amino: John Cass, Trent Maki

ArcelorMittal: Isadora van Riemsdijk

CANMET: Kevin Boyle

Ford: Sergey Golovashchenko

U Waterloo: Michael Worswick, Jose Imbert

U Windsor: Darya Amirmaleki, Daniel Green, Amir Hassannejadasl, Arash Jenab, Morteza Nurcheshmeh, Chris Maris, Brent McCallum, Javad Samei, Iman Sarraf, Kevin Young

**Meeting minutes:**

After Trent welcomed the participants to Amino and introductions were made, Morteza gave an overview of the APC project in terms of the different phases of the work and the originally proposed timeline.

Sergey showed Ford’s proposed changes to the dash panel hydromechanical draw die. The existing die being made of a single-piece punch has been unable to form the dash panel for sheet materials other than mild steel; therefore there is a need to redesign the tooling for this drawing operation: finite element simulations showed that it would be possible to form a dash panel from DP600 steel provided a three-piece punch is used: the two outside punches would act first and then the central punch would complete the drawing process. Following this hydromechanical draw, the drawn shells would subsequently be shipped to Ford in order to be electro-hydraulically formed to the full CAD specifications.

There followed a general discussion on the characterization of the sheet materials for this project. DP600-GI and TRIP780 steel sheets were provided by ArcelorMittal in June and the AA-5182 aluminum sheets are being order from Novelis. It was agreed that the University of Waterloo would carry out the mechanical testing of sheet materials in uniaxial tension at strain rates ranging from 10-3 to 103 and develop the electro-magnetic ring expansion test in order to reach strain rates around 104. CANMET will carry out the Marciniak tests to obtain the as-received FLD and the hydraulic bulge tests to determine the equibiaxial yield stresses and flow curves.

Jose presented the preliminary developmental work that is being done on the electro-magnetic ring expansion tests apparatus. The issues with ring specimen preparation and analysis of experimental data were discussed to some length.

Javad presented some microstructural observations on DP500, DP780 and DP980 steels and showed formability improvements in EHF compared to quasi-static Nakazima tests. He also showed that the increase in void density is significantly slower in EHF specimens. TEM observations showed the presence of twinning in the Martensite. Fractography showed quasi-cleavage and shear fracture in EHF specimens. The reader should refer to Javad’s presentation for further details.

After lunch, Trent and John conducted a plant tour of the Amino production facility.

Amir presented his finite element modeling of the electrohydraulic forming process using Eulerian elements for the water and Lagrangian solid elements for the sheet material. The JC hardening model and the JC damage model were used in the simulations, and the determination of the JC parameters was discussed. Numerical predictions of failure correlated well with fractured DP steel specimens that were electro-hydraulically formed in a conical die.

Iman gave attendees a tour of the website that was created for this APC project: the site will be accessible to partner organizations and will be password protected. The material characterization data, experimental data, meeting minutes and presentations, publications etc. will be uploaded to this site for partners to access at their will.

A brief review of the terms & conditions of the APC grant was provided by Daniel, emphasizing the first progress report that is due on October 1, 2012 and requires input and a letter of support from every partnering organization. It was agreed that a 6-month extension would be requested from NSERC, which would mean that the progress report would not be due until April 1, 2013.

The meeting was adjourned around 4:30 pm.