

Flash® Processed Steel for Automotive Applications

DE-EE9997877 – Phase III

SFP Works, LLC (now Flash Steelworks, Inc)

April 2017 – December 2019

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U.S. DOE Advanced Manufacturing Office Program Review Meeting

Washington, D.C.

June 11-12, 2019

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Overview

Project Title: Flash® Processed Steel for Automotive Applications

Timeline:

Project Start Date: 04/01/2017

Budget Period End Date: 12/31/2019

Project End Date: 12/31/2019

Barriers and Challenges:

- Developing induction heating methods for Flash Processing in wider format that duplicates what Auto OEM testing has shown
- Proving that Flash technology can be consistently performed across the width of a steel coil for the length of the coil with consistent properties

AMO MYPP Connection:

- New process for advanced materials
- AMO 5-year plan targets room temperature formable 1800MPa steel

Project Budget and Costs:

Budget	DOE Share	Cost Share	Total	Cost Share %
Overall Budget	\$1.48M	\$0.23M	\$1.71M	16%
Approved Budget (BP-1&2)	\$1.48M	\$0.23M	\$1.71M	16%
Costs as of 3/31/19	\$1.41M	\$0.13M	\$1.54M	9%

Project Team and Roles:

- Flash Steelworks as PI
- Steel Equipment Specialists (SES) to construct material handling aspects
- Ajax TOCCO to develop induction heating equipment tailored to high volume Flash Processing
- Fluxtrol for induction heating coil design

Project Objectives



Done: Cold-stamped 1500 MPa Floor Reinf

The Problem:

- Flash processing has been proven to produce high strength, cold stampable sheet for game-changing weight reduction in cars. *This is the Holy Grail for automakers.*
- But the lab scale system could only process small sheets. Automakers and metal suppliers need to know this will work at scale, and provide consistent strength levels coil to coil.
- Private investment was stalled. No one would ante up without proof!

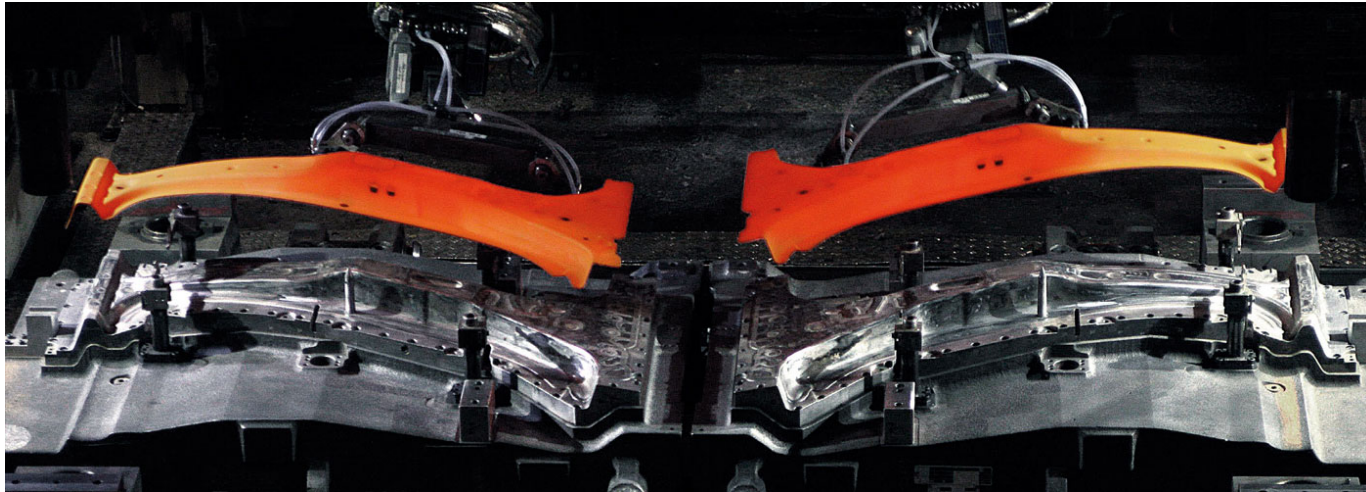
The Solution:

- SBIR Phase III Pilot line to process 20,000-lb coils for automaker evaluations. Induction heating coil design and line speed will be optimized for product uniformity and productivity.
- Automotive lightweighting: 50% weight reduction for individual components. Energy savings $\sim 2\%$ /car/year = ~ 0.18 Quads/year
- Aligned with AMO's MYPP goals: New process for advanced materials

Technical Innovation

High Strength Steel Today:

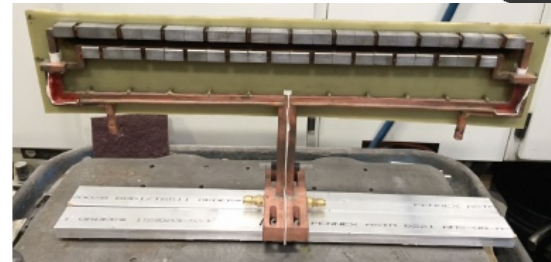
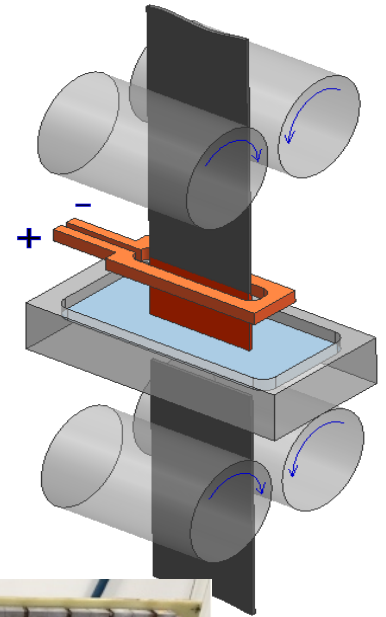
- Automakers use expensive boronized steel for high strength
- But the parts must be hot stamped
- They not only have to pay more for the steel (e.g., 80¢/lb vs. 40¢/lb.) but it's more expensive to stamp!
- This limits use in vehicles



Technical Innovation

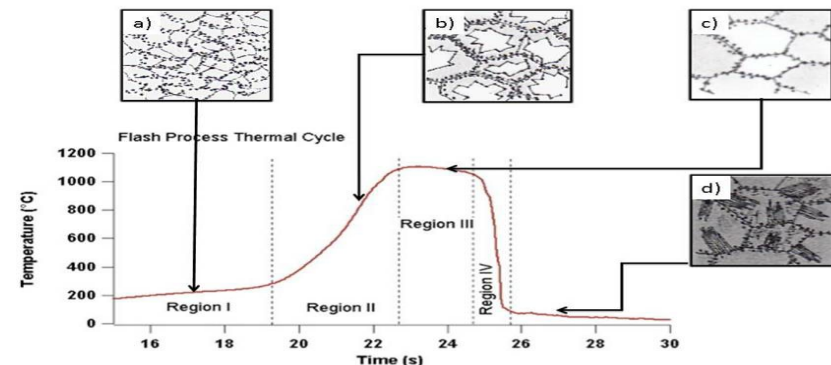
Solution: Flash Processing is a radical new way to heat treat steel

- Thin sheet induction heated in a few seconds, low energy; No long hold, just quench, and don't have to temper
- Continuous process
- Tensile strength of 1500 MPa^+ , 2X – 3X that of high strength low alloy steels
- Uses plain carbon (off-the-shelf 1020) steel
- Costs about 40¢/lb. vs. 80¢/lb for DP1180
- Low capital equipment costs
- Excellent cold stamping performance
- Good weldability



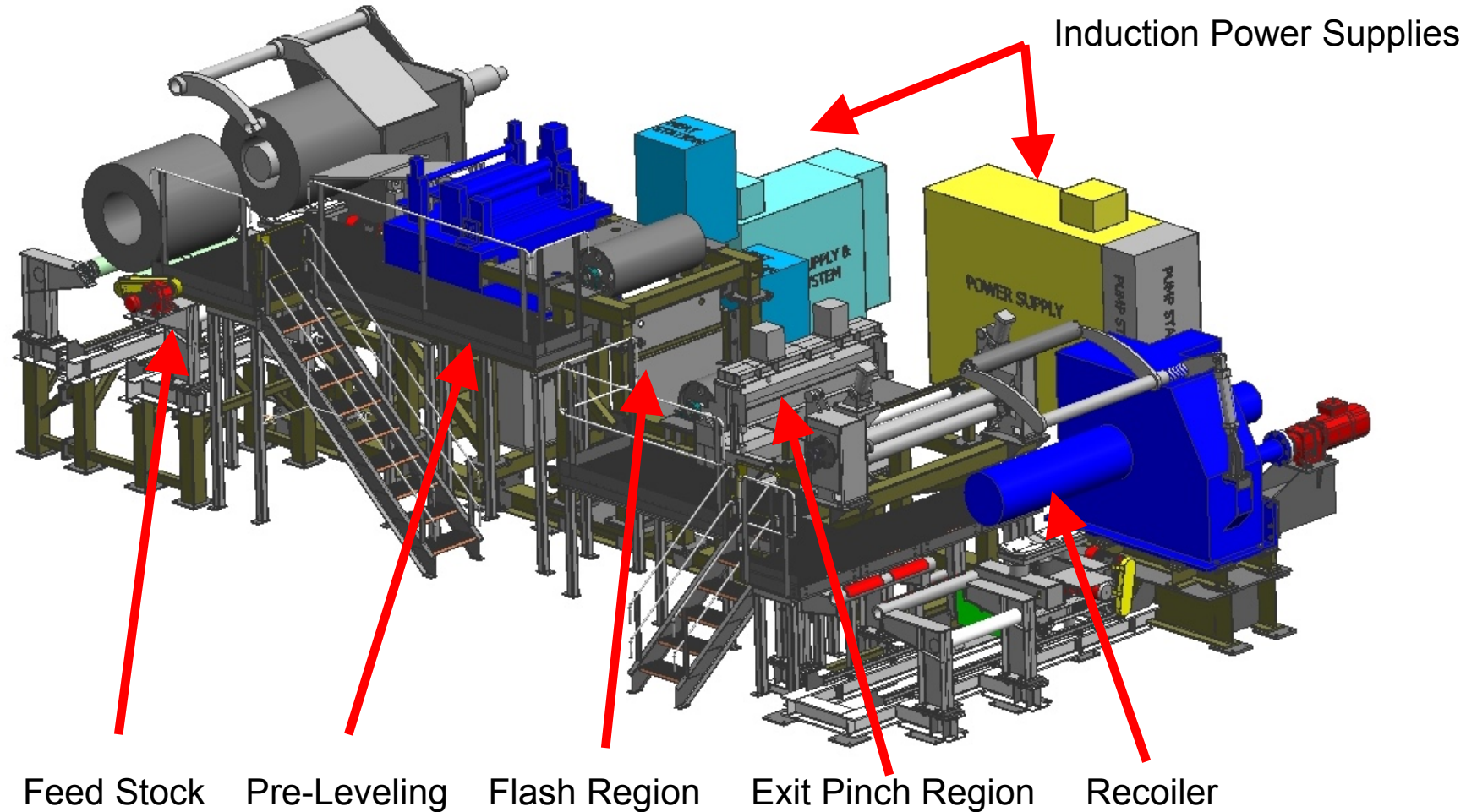
Technical Risk

- Still maturing understanding of the scientific basis for improved formability
- High speed processing may not yield the same properties



Technical Approach

Flash® Bainite MRL-5 Processing Line Design



Technical Approach

Capacity: 20,000 lb coils, 36" wide, 8 feet/minute



Technical Approach

Flash® Bainite continuous line
Custom-designed 1.6 Megawatt Induction Unit,
New coil design for temperature uniformity



Results and Accomplishments

- Project is 90% complete.
- Steel Equipment Specialists has completed the construction of the material handling aspects of the Flash Coil line and equipment is installed at Flash.
- The Ajax TOCCO induction heating equipment is installed at Flash after passing quality control inspection at Ajax.
- Electrical connections are complete. Plumbing is 95% complete.
- Fluxtrol has completed the build of the induction heating coil and installation is underway.
- Auxiliary heat exchanger build underway
- Cooling tower installation 95% complete
- Plumbing finalization underway
- Trial runs expected in July/August 2019

Transition (beyond DOE assistance)

- Commercialization will occur via Pilot Line development ultimately resulting in OEM/Tier 1 adoption/licensing of the technology at the manufacturing center itself.
- In discussion with multiple U.S. automakers, some of whom have already evaluated specific parts.
- Multiple steel mills are evaluating Flash[®] Processing for potential adoption.
- Steel warehouses and re-rollers could readily install Flash[®] Processing lines.

Questions?



***2017 SBIR/STTR
Small Business of the Year***