NORTHROP GRUMMAN

DEFINING THE FUTURE

Induction Brazing for Shipboard Pipe Applications

Spring 08 SP-7 Meeting

Dayton, Ohio

March 4 – 5, 2008

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Northrop Grumman Shipbuilding
New Orleans

Why Bother? What's wrong with my torch?

- Induction Brazing allows us to reduce the hazards of hot work, no open flame, no shipboard fires
- Reduced cycle time. 2 minutes for induction brazing vs. 6 minutes for torch brazing
- Operator skill level less critical. Will allow the use of less experienced brazers on shipboard joints with difficult access
- The heating cycle is consistent and repeatable, no variation between brazers. Consistent braze joint quality

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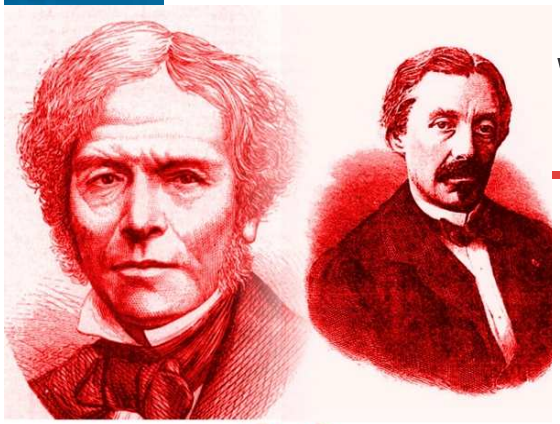
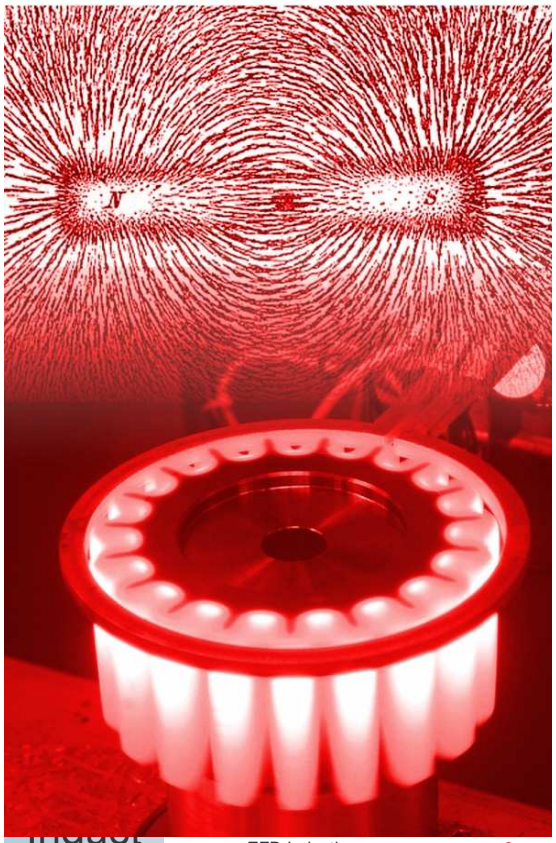
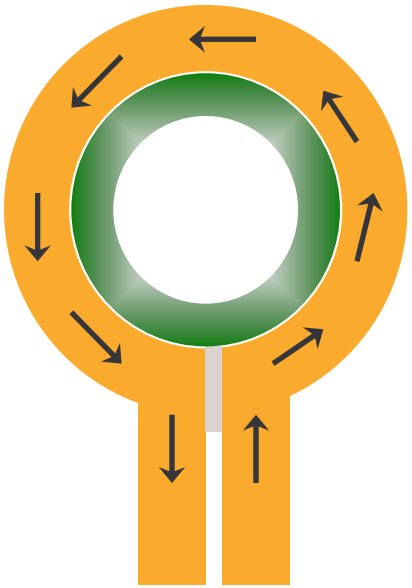


$$\varphi = \iint_S \vec{B}.\mathrm{d}\vec{S}$$



What is Induction Heating?

When an alternating current flows through an induction coil a magnetic field is generated



Induction Heating Coil

This field is concentrated on the inside of the coil and its magnitude depends on the strength of the current and the number of turns in the coil

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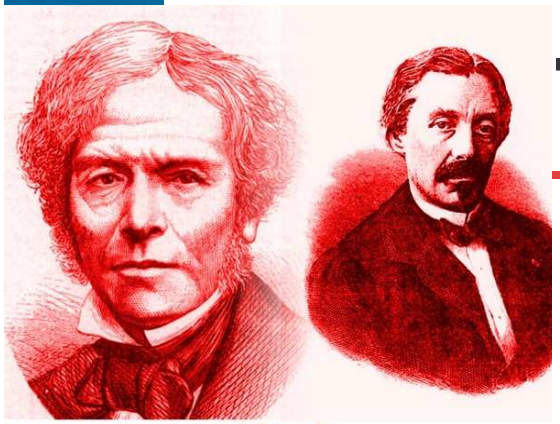
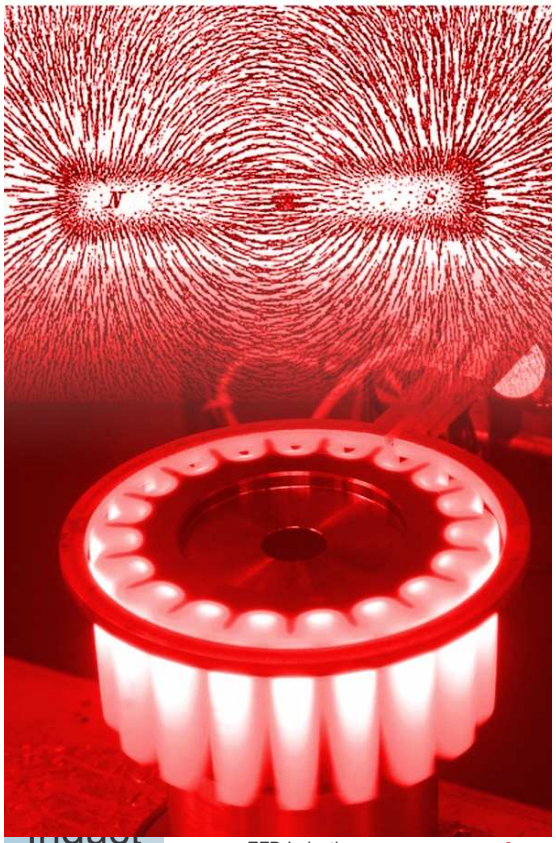
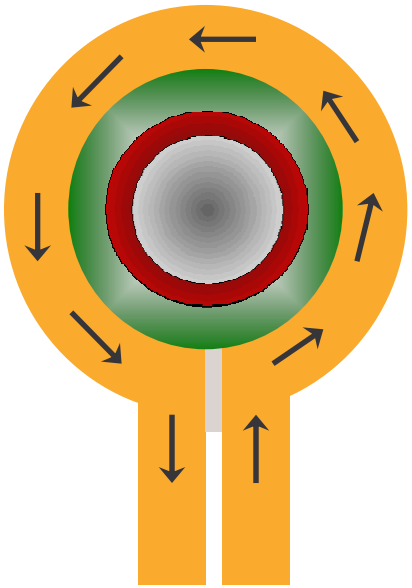


Theory of Induction Heating

$$\varphi = \iint_S \vec{B}.\mathrm{d}\vec{S}$$



If a metal object is placed in the coil, eddy currents will be induced in the object



Induction Heating Coil

Due to the resistance of the material, heat is developed in the region through which the eddy currents flow

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Project Team Members

- EFD Induction, Tom Brown
- Bath Iron Works, Mike Ludwig
- Northrop Grumman Shipbuilding Newport News, Paul Hebert
- Northrop Grumman Shipbuilding New Orleans, Pat Hoyt

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Schedule

Quarter	Task	Description	Performed By	Due Date
1	1	Determine fitting types and pipe sizes most prevalent among the shipyard team members.	NGS, NGNN, BIW	1/17/08
1	2	Quarterly Status Report	EFD, NGS	3/31/2008
2	3	Develop reusable induction brazing coils based on shipyard requirements	EFD	5/19/08
2	4	NGSS utilizes reusable coils with brazing unit to determine conformance to Navy brazing requirements	NGS	6/19/2008
2	5	Quarterly Status Report	EFD, NGS	6/30/2008
3	6	EFD develops shipboard pipe brazing unit	EFD	9/19/2008
3	7	Quarterly Status Report	EFD, NGS	9/30/2008
4	8	NGS demonstrates shipboard pipe brazing system	NGS	12/4/2008
4	9	Final Report	EFD, NGS	12/19/2008

Questions?

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