Workshop
Agenda
Donsco Inc
Wrightsville, PA

January 10, 2024

8:00-8:30 am
Check-in & Networking

8:30-8:45 am
Welcome: Workshop Objectives & Expected Outcomes
Speakers: Chris BUCK & Todd HUTCHESON

8:45-9:30 am
F4.0 Overview; Assessment Process & Business Value
Speaker: Todd HUTCHESON

9:30-9:40 am
Introduction to the University of Northern Iowa's Foundry 4.0 Center and Center for Business Growth & Innovation
VIDEO5, Speaker: Todd HUTCHESON

9:40-10:00 am
Networking Break

10:00-10:30 am
Designing for Automation & Foundry 4.0
Speaker: Josh O’DELL

10:30-11:00 am
Robotic Casting Finishing & Process Sensors
Speaker: Sam MANTERNACH

11:00-11:30 am
Sensor/PLC Applications, IoT & Data Analysis
Speaker: Nate BRYANT

11:30-12:00 pm
Dual Robo with 3D Bin-picking System
Speaker: Donsco REPRESENTATIVES

12:00-1:00 pm
Lunch & Networking

1:00-1:30 pm
The YSU ETC & Foundry/Post-processing Lab
Speaker: Andy PROKOP

1:30-2:00 pm
Panel & Q&A
Speakers: Josh/ Sam/ Nate/ Andy/ Donsco TEAM

2:00-2:45 pm
Organizational ReWilding
Speaker: Matthew POHL (ReWild Group)

2:45-3:00 pm
Networking Break

3:00-3:30 pm
ReWilding Business Assessment & Growth Groups
Speakers: Matthew POHL & Todd HUTCHESON

3:30-3:40 pm
Closing & Donsco Foundry Tour Introduction
Speaker: Chris BUCK

3:40-4:00 pm
A Journey to Donsco Foundry for Tour

4:00-5:30 pm
Donsco Foundry Tour
Speakers: Chris BUCK & Donsco TEAM

6:00-8:00 pm
Networking Happy Hour & Dinner
Location: John Wright Restaurant

7:00-8:30 pm
Booze Quality Castings
Address: 402 Schaeffler Rd; Lebanon, PA 17042

January 11, 2024

Partners:
NCDMM
CENTER FOR BUSINESS GROWTH & INNOVATION
FOUNDRY 4.0 & METAL CASTING CENTERS
YOUNGSTOWN STATE UNIVERSITY
Excellence in Engineering Center
YOUNGSTOWN BUSINESS INNOVATION
FOUNDRY 4.0: “Steps to Success” Workshop Events

FOUNDRY 4.0

Welcome!
welcome.

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Sensor/PLC Applications, IoT & Data Analysis
Workshop Expectations & Outcomes

• Continue to pursue a mission of expanding the understanding and use of Industry 4.0 concepts in metalcasting
• Provide unique business & technical education opportunities to foundry & casting industry partners
• Demonstrate potentially directly useful applications in daily foundry operations
• Display F4.0 technical assessment capabilities and feasibility assessment potential
• Encourage information/data sharing through networking among foundry industry professionals
Step #1 Exploration of Foundry 4.0, Evaluation Procedure, and Business Impact

Discover effective techniques for assessing Foundry 4.0, identifying deficiencies, and prioritizing opportunities to maximize business impact.
FOUNDRY 4.0: “Steps to Success” Workshop Events

FOUNDRY 4.0
Overview, Assessment Process, Business Value
METALCASTING INDUSTRY Statistics

• The 2020 direct & indirect **US economic benefit** from the metalcasting industry (1):
  ○ **Economic Impact** = $110.5B (Direct = $44.3B)
  ○ **Jobs** = 492.6K (Direct = 162.8K)
  ○ **Wages** = $32.2B (Direct = $11.6B)
  ○ **Tax revenue** = $10.6B

• **US Government** equipment, product and service supply chains **rely heavily** on the foundry & casting industry

• From 2014 and 2023-est (2)
  ○ 162 (9%) of **existing US foundry facilities closed**
  ○ **Per facility revenue increased** by $6.5M (30%)

Metalcasting Industry Vital to the U.S. Economy

A highly modern industry with ancient roots and today’s cutting-edge technology, metalcasting is the backbone of the manufacturing economy. It is an industry with a total economic output of $110.52 billion that provides almost 500,000 U.S. jobs, directly and indirectly. The industry is central to a growing economy, modern infrastructure, and national defense. Moreover, metalcasting provides excellent careers for those with the right skills.

Metalcasting Matters

U.S. made metal castings are critical to:  
- Aircraft  
- Appliances  
- Automobiles  
- Motorcycles and Trucks  
- Cookware  
- Defense Technology  
- Farm Equipment Needed to Harvest Food  
- Golf Clubs  
- Medical Devices  
- Mining and Construction Equipment  
- Pipelines that Deliver Clean Water  
- Power Plants that Supply Electricity  
- Pulp and Paper  
- Railroads and Mass Transit

- Ships and Submarines  
- Stadium Seating  
- Ventilation  
- Wind Turbines

Economy
- More than 1,719 metalcasting facilities nationwide.
- Providing direct & indirect employment for more than 400,000 workers.
- Nearly 80% of U.S. metalcasters are small businesses employing less than 100 employees.

Total National Economic Benefit

- Direct & Indirect
  - Economic Impact: $110.52B
  - Jobs: 492,565
  - Wages: $32.16B
  - Tax Revenue: $10.59B

Direct Economic Benefit

- Industry Jobs: 162,816
- Wages: $11.61B
- Economic Impact: $44.29B

This 2020 economic research was conducted by John Dusham & Associates.
“This research is sponsored by the DLA-Troop Support, Philadelphia, PA and the Defense Logistics Agency Information Operations, J68, Research & Development, Ft. Belvoir, VA.”
UNI BCS

UNI CBGI
CENTER FOR BUSINESS GROWTH & INNOVATION

UNI FOUNDRY 4.0 CENTER
- LAB & Training
- Foundry Education
- Metal Manufacturing
- Processes Technology
- Metal Casting Materials
- Assistance

UNI MCC
& FOUNDRY 4.0 CENTER

DEFENSE LOGISTICS AGENCY
NCDMM

YOUNGSTOWN State University

FOUNDENCY 4.0
Technologies revolutionizing the metal casting industry!

Partners:
- NCDMM
- UNIVERSITY OF NORTHWEST INNOVATION
- YOUNGSTOWN STATE UNIVERSITY
- TRUMP ADMINISTRATION
- BUSINESS INNOVATION NETWORK
TAKING FOUNDRIES TO THE NEXT LEVEL

FOUNDRY 4.0
Technologies revolutionizing the metal casting industry!
Create resiliency in the FOUNDRY & CASTING INDUSTRY through the implementation of Industry 4.0 technology.
Industry/Foundry 4.0
OVERVIEW
What is INDUSTRY 4.0? & HOW DID WE GET HERE?

NOTE:
INDUSTRY 4.0
applied to an industry
can become “Foundry
4.0”, “Manufacturing
4.0”, “Logistics 4.0”
… all apply similar
principles

Industry 1.0
Around 1760
Mechanization

Industry 2.0
~1860s onwards
Automation

Industry 3.0
~1970s
Digital

Industry 4.0
~ 2000 - Today
AI & ML,
cyber physical
systems

Industry 5.0
Concept was
presented by
Japan at the
CeBIT 2017
trade fair in
Hannover
(Society 5.0)

INDUSTRY 5.0
Is future of work,
referring to people
utilizing robots and
intelligent machines
to drive productivity
and economic growth

Industry 4.0

- Automation
- Connection
- Cloud computing
- IOT
- Big data
- System integration

Boosting production
Increasing profit margins
Total business automation
Quick adaptation to customer needs
Reducing human labor

UNDERSTANDING INDUSTRY 4.0 Technologies

Managing Information
- Horizontal & Vertical System Integration
- Big Data & Analytics
- Internet of Things (IoT)
- Cloud Computing
- Cyber Security

Producing & Performing
- Autonomous Robots
- Additive Manufacturing (3D Printing)

Designing & Testing
- Augmented Reality
- Simulation & Digital Twin

Business Success Elements
- Business “Wild Cards”
- Organizational Culture

BROAD BUCKETS
WHY IMPLEMENT INDUSTRY 4.0?

- Real-time Data and Analytics
- Cost Reduction
  - Increased Efficiency & Productivity
  - Supply Chain Optimization
  - Improved Product Quality
    - Reduced Scrap Rates
    - Enhanced Quality Control
    - Predictive Maintenance
- Customization and Flexibility
  - Faster Time to Market
  - Enables Iterative Innovation
  - Competitive Advantage
- Enhanced Safety
- Workforce Alternatives
- Global Connectivity
**I4.0 IMPROVEMENT METHODOLOGY**

**GOAL:**
Provide Applied, True Business Value

**BEGIN HERE**

02 Assessments

03 Key Business Performance Indicators

04 Implementation, Integration

05 Technology Research & Development
Technical Assessment Process
ELEMENTS OF INDUSTRY 4.0
Improvement Implementation
ELEMENTS OF INDUSTRY 4.0
Improvement Implementation

1. DATA COLLECTION
2. ASSESSMENT
3. KEY PERFORMANCE INDICATORS
4. ACTION PLAN & IMPLEMENTATION
5. I4.0 Improvement Potential Summary Report
   - Summary of Findings
   - Key Opportunities
   - Considerations
   - Other Comments
I4.0 Assessments are relatively commonplace, but suffer from a general lack of ease of use administering the survey, from gathering inputs from either too few or incorrect participants, and an inability to provide segmented summary data from different groups within a business. Garbage in, garbage out … correcting these issues is paramount in achieving meaningful results from an assessment.
**INPUT DATA COLLECTION**

1. **1a**
   - Broad cross-section survey data gathering collected by I4.0 pillar, by pillar aspect

1. **1b**
   - Survey data is consolidated by company-defined groupings, made available real-time for analysis and discussion via a Google survey and an emailed link to identified participants
Once the correct level of assessment data has been collected from the most knowledgeable sources within a business, assessment scoring and the consolidation of scores can be processed real-time. Automated report sets can keep up with inputs provided, and the analyzed data can be split into meaningful groups for further discussion. Automating the assessment frees up time for these individuals to discuss implementation value.
<table>
<thead>
<tr>
<th>Pillar</th>
<th>Average Score</th>
<th>Min Score</th>
<th>Max Score</th>
<th>Average Weight</th>
<th>Adjusted Weight</th>
<th>Min Weight</th>
<th>Max Weight</th>
<th>Gap</th>
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<td>9 Cyber Security</td>
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Assessment Summary

- **Average Score**
- **Min Score**
- **Max Score**
- **Average Weight**
- **Average Score of All Pillars**

Pillars:
- Autonomous Robots: 2.40
- Additive Manufacturing: 4.60
- Augmented Reality: 0.00
- Simulation & Digital Twin: 4.00
- Horizontal and Vertical System Integration: 2.80
- Big Data and Analytics: 3.63
- The Internet of Things: 3.33
- Cloud Computing: 4.00
- Cyber Security: 5.00
- Wild Cards within a Business: 2.20
- Organizational Culture: 2.50
- Industry 5.0: 2.00
GAPS BY PILLAR
Business Value
Different technologies impact different areas in a business environment. The connections between I4.0 technologies and the key performance indicators they impact has been proven. Although “your results may vary”, by making good assumptions about the potential improvements possible through technology implementation, a predictive model can be created to focus implementation in the highest value areas.
INDUSTRY 4.0

Key Performance Indicators (KPIs)

- Operating Efficiency
- Overall Equipment Effectiveness
- Product and Process Yield (Scrap or Rework $$s$$)
- Capacity and Capacity Utilization
- Inventory Levels ($$s$$, turns)
- Data Security
- Improved Customization
- Throughput Reduction
- Prototype Turnaround Time
- Improved Safety (reduced workers comp, etc.)
- And more…
<table>
<thead>
<tr>
<th>Key Performance Indicator Impacted by Implementation</th>
<th>Autonomous Robots</th>
<th>Additive Manufacturing</th>
<th>Augmented Reality</th>
<th>Horizontal &amp; Vertical System Integration</th>
<th>Simulation &amp; Digital Twin</th>
<th>Big Data &amp; Analytics</th>
<th>The Internet of Things</th>
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<th>Wild Cards within a Business</th>
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**INDUSTRY 4.0**

*Key Performance Indicators (KPIs)*

**Improvement Example #1:**

*Technology Improvement perspective*

- **Identified Gap:** *Augmented Reality*
- **Potential KPI Impacts:**
  - Product & Process Yield
  - Improved Customization
  - Prototype Turnaround Time
- **Basic Technology Feasibility (Payback):**
  - $150K implementation, rolled product yield improvement of 1% in a $30M annual COGs foundry
  - Payback = .5 years
- **Additional benefit from other KPI improvements** reduces payback time
• Identified Opportunity: Inventory Level Improvement

• Potential I4.0 technology application:
  ○ Autonomous Robots
  ○ Simulation & Digital Twin
  ○ Big Data & Analytics
  ○ IoT

• Basic Technology Feasibility (ROI):
  ○ Data analytics identifies environmental factor changes that improve process yields, resulting in a WIP inventory reduction of $500K
  ○ Sensors, PLCs and data analysis software cost = $100K
  ○ Carrying costs on $50M = 25% or $125K annually
  ○ ROI = $125K/$100K = 125%

• Additional benefit from other KPI improved by data analytic capability implementation improves ROI
Connecting technology gaps to impacted key performance indicators, and creating a prioritized implementation feasibility study that predicts where business value can be seen, allows a business to create an action plan that is sequenced in value priority order. This plan will have predictable contents based on the technologies selected.
Business Value Action Plan

I4.0 Technical Assessment Summary Report

• Summary of Findings
• Key Opportunities
• Considerations
• Other Comments
The FOUNDRY 4.0 Partnership works to provide American-based foundries with the competitive edge in technology that optimizes productivity, output, and product quality. These technological innovations create opportunities that help build a dynamic digital ecosystem. Several notable advantages are cost reduction, shortened deadlines, and excellence in quality and customer satisfaction.
Industry 5.0
What is Industry 5.0?

- **Industry 5.0** is a shift that focuses on the collaboration between humans and machines, emphasizing the importance of human touch, craftsmanship, and the creative potential of individual workers.

- It builds upon the principles of **Industry 4.0**, which primarily focused on digitization, automation, the Internet of Things (IoT), and advanced analytics.

- **Industry 5.0** provides benefits to a business in the areas of:
  - Customization & Flexibility
  - Environmental Sustainability
  - Enhanced Worker Satisfaction
  - Economic Growth
  - Resilience

**Industry 5.0** attempts to balance interaction between humans and automation.
So ... what does INDUSTRY 5.0 OFFER?

Industry 5.0 is aimed at supporting – not superseding – humans

- Tesla CEO Elon Musk tweeted - “excessive automation” was a mistake, “Humans are underrated.”
- Robots … much more consistent than humans, better at precision work, BUT inflexible and incapable of the adaptability and human-level critical thinking

Industry 5.0 is about finding the optimal balance of efficiency and productivity

- Man and machines must be interconnected to meet the manufacturing complexity of the future

The progress of Industry 5.0 is unavoidable

- Once technology is used to make a process more efficient, there’s no point in reverting back
- Ex. typewriters → computers w/ word processing SW → voice recognition w/auto-correct

Automation Leverages Technology to Help Humans Work Better and Faster
SUMMARY: ELEMENTS OF INDUSTRY 4.0 IMPROVEMENT IMPLEMENTATION
Nearly all business sectors are experiencing a unique set of difficult business headwinds … and they will not go away in the foreseeable future.

Industry 4.0 technology implementation can provide a large boost in combating these headwinds.

Industry 4.0 technology assessments and connection to business value feasibility studies to prioritize investments provide increased business value.

Industry 5.0 attempts to balance interaction between humans and automation.

Automation Providing Predictable Business Value Through Prioritized Technology Implementation
Please take a moment to access our registration form by clicking here.
https://docs.google.com/forms/d/1J3ts3rpz5DPmPNBXLWVH5rl3_pl87wM CZMdjWpZlWwo/edit

or ... just contact Todd Hutcheson at todd.hutcheson@uni.edu or (319) 431-6396

Upon submission of the form, we will promptly reach out to initiate the assessment process for both you and your team. This enables you to harness the power of Industry 4.0 technologies, strategically positioning your business with the latest advancements and ultimately enhancing overall business value. At ZERO cost to your business.
Assessment opportunity
Q&A
Step #2 Design for Success, design for excellence (Dfx)

Learn the cost-saving benefits of designing for automation excellence, contributing to overall cost reduction strategies.
Step #3 Technical Data Gathering and Analysis in Industry 4.0/Foundry 4.0

Explore the core role of data in Industry 4.0/Foundry 4.0, focusing on IoT sensor integration and the utilization of Big Data in the context of metal casting.
Step #4 Organizational Rewilding and ReWild Business Assessment: A Dual Insight

Discover Organizational Rewilding, a strategy designed to promote sustainable business growth. Learn about the RBA's role in transformation, highlighted by key findings and success stories.
Workshop Expectations & Outcomes

✓ Continue to pursue a mission of expanding the understanding and use of Industry 4.0 concepts in metalcasting
✓ Provide unique business & technical education opportunities to foundry & casting industry partners
✓ Demonstrate potentially directly useful applications in daily foundry operations
✓ Display F4.0 technical assessment capabilities and feasibility assessment potential
✓ Encourage information/data sharing through networking among foundry industry professionals
NEXT STEPS

• Review Workshop materials for potential additional conversations
• Exercise new contacts made to continue collaborative networking discussions
• Contact speakers as needed to explore topics of interest more fully
• Attend additional workshops if interested
• Contact UNI CBGI to begin an F4.0 Technical Assessment partnership engagement

Our Goal: Enable Application of Foundry 4.0 Concepts to Continue to Improve the Resiliency of the Foundry & Casting Industry
Please take a moment to access our registration form by clicking here.

https://docs.google.com/forms/d/1J3ts3rpz5DPmPNBXLWVH5rl3_pl87wM
CZMdjWp2lWwo/edit

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UPCOMING Workshop Events

2024

2-DAY STEPS TO SUCCESS WORKSHOP EVENTS

In-Person & Virtual

JANUARY 10 & 11
124 North Front Street
Wrightsville, PA

JANUARY 24 & 25
204 E 5th Street
South Pittsburg, TN
UPCOMING Workshop Events

Register NOW! Complimentary Workshop: Attend In-Person or Online!

Two Workshop Locations

- JANUARY 10 & 11
  - Wrightsville, PA
  - Donasco Inc., Click here

- JANUARY 24 & 25
  - South Pittsburg, TN
  - Lodge Mfg., Click here

Scan the QR-Code

Hosts & Organizers

- Chris BUCK, Donasco Inc., VP, Operations
- Scott LAKEY, Lodge Mfg., Director of Foundry Operations
- University of Northern Iowa (UNI): Center for Business Growth & Innovation (CBGI)
- Paul KINGHORN, UNI-CBGI, Director
- Todd HUTCHESON, UNI-CBGI, EIR

Guest Speakers

- Andy PROKOP, YSU, Excellence Training Center, Project Technician
- Matthew POHL, The ReWild Group, LLC, Certified Adviser & Instructor
- University of Northern Iowa (UNI): Foundry 4.0 & Metal Casting Centers (MMC)
- Josh O’DELL, UNI, F4.0 Center, Project Engineer
- Sam MANTERNACH, F4.0 Center, Project Engineer
- Nate BRYANT, UNI, Ind. Tech. Center, Asst. Project Manager
11 January | 2024
Thursday

10:00-12:00 pm
Boose Quality Castings
Address: 402 Schaeffer Rd; Lebanon, PA 17042
Thank YOU

cbgi@uni.edu
foundry4.0@ncdmm.org

NOTES:
1. This research is sponsored by the DLA-Troop Support, Philadelphia, PA and the Defense Logistics Agency Information Operations, J68, Research & Development, Ft. Belvoir, VA.

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FOR MORE INFORMATION

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