

MANUFACTURING APPLICATIONS EXPO

MAX[®] INTERNATIONAL

COME TO
THE **DRIVING FORCE**
AT THE CORE OF THE
MANUFACTURING INDUSTRY

STAMPING

FORMING

WELDING

CUTTING

ROBOTICS

LASERS

JOINING

FABRICATING

PIPE/PLATE

SERVICES

SUPPLIES

May 6-10, 2001

International Exposition (I-X) Center, Cleveland, Ohio

Starring



**WELDING
SHOW2001**

and



Visit us at www.maxinternationalexpo.com

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SUPPLIES

...What You Need To Compete

No matter if the economy goes up or down, competition will increase.

Over the next 12 months you will have to know how to compete more intensely than ever before to keep your plant running or your shop open and to make a decent profit.

- ▶ What new equipment and technologies should you buy to increase your productivity?
- ▶ How do you better utilize your existing plant and equipment to be more productive and cost competitive?
- ▶ How will you find out what is going on in our industry?
- ▶ Where will you learn how other people are solving challenges similar to yours?
- ▶ How can you make your own plans for the future?

MAX INTERNATIONAL® is the one event you should attend

It has been created to provide you with leading edge products, technology, people, education and information that you will need to succeed **no matter if the economy goes up or down.**

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**By attending
MAX INTERNATIONAL
you'll get:**

- In-depth coverage of the applications at the core of the manufacturing industry
- More new products and technology introductions
- More new ways to utilize your existing equipment
- Key industry information
- More ways to make more money

MAX INTERNATIONAL is the largest and most in-depth metal working event in North America. Featuring the METALFORM ExpoSium and the AWS WELDING SHOW, MAX INTERNATIONAL brings you the total spectrum of equipment and technology applications for manufacturing, structural fabrication, job shop and mixed production environments.

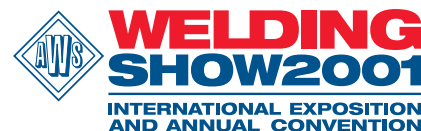
MAX INTERNATIONAL is a comprehensive and integrated manufacturing event. No matter what equipment or manufacturing technologies you now use or are considering, you will find them here. Nearly 1,000 exhibitors will fill the Cleveland I-X Center with the equipment, technology, applications, and information to help you be more competitive.

**Thousands of experts to
help you succeed**

Every MAX INTERNATIONAL exhibitor wants you to bring them your tough questions. Whether you are looking for new equipment, or want to get more productivity out of your existing equipment, our exhibitors are here to help you get answers. Bring your problems, equipment needs and questions to MAX INTERNATIONAL. Let our world-class experts help you get the right answers, the right equipment, and the targeted solutions you can take back and put to work.

Network with the industry's best

MAX INTERNATIONAL is your opportunity to network with more than 32,000 professionals from North America and around the world. Manufacturing professionals who can share their experiences, or who already may have solved the problems you are facing. This is also a great opportunity to catch up on the "inside" news and changes taking place in our industry as well as to build potential sources of new business.



The AWS Welding Show 2001 is the industry's largest and most comprehensive event for the science, technology, equipment and supplies for all welding applications and processes. From production line and robotic welding systems to laser, resistance, electron beam, and arc welding technologies you will see all the major manufacturers, equipment and applications at the AWS Welding Show 2001.

Free to all attendees is the AWS Advanced Technologies sessions, which will examine the welding of sheet metal, laser technology, process optimization, and friction stir welding.

Also FREE is the U.S. Open Weld Trials where six young finalists will compete head-to-head to represent the United States in World Skills Competition in Korea.



METALFORM 2001 is the definitive and comprehensive source of equipment, technology, applications and information for the metalforming industry. From stamping presses of every size and application to tool & die, punch press and laser fabricating systems to material handling equipment... this event has it all. No other event in North America has the depth or comprehensiveness of these core processes and applications as does METALFORM 2001.

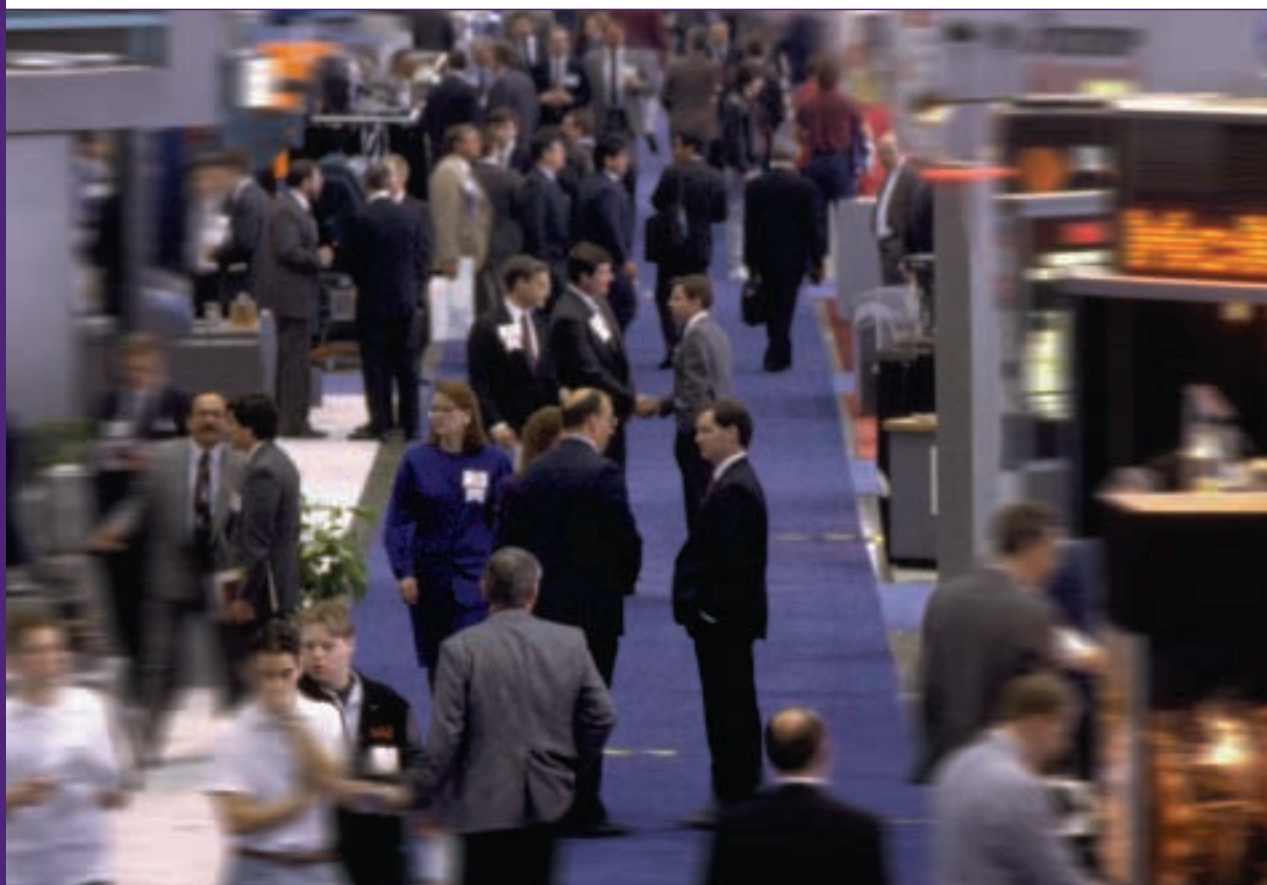
When you visit METALFORM 2001 you'll be able to see all of the latest technology and equipment. You will be able to meet with your current equipment suppliers to learn how they have been able to increase the productivity of their equipment and how that can benefit your own needs and applications. You will also see how to integrate various applications into continuous processes and sub-



assembly systems. And, you'll also find that one exhibitor who can answer a key question to improve the cost competitiveness of your operation.



Symposium and Professional Program attendees will receive a complimentary CD-ROM of proceedings—your complete guide to all PMA technical papers and AWS abstracts.



PRODUCTS

- STAMPING
- FORMING
- WELDING
- CUTTING
- JOINING
- ROBOTICS
- LASERS
- PIPE/PLATE
- FABRICATING
- SERVICES
- SUPPLIES

Right For Your Business

No matter what manufacturing or fabrication business you're in MAX INTERNATIONAL is right for you.

- Long run production
- Short run production
- Job shop production
- Job shop fabrication
- Field fabrication
- Construction, bridge, marine, and architectural fabrication
- Assembly and sub-assembly
- Welding
- Stamping
- Multi-step integrated production
- R&D
- Prototyping
- Consulting
- Distribution

Bring Your Team

Bring your whole team to MAX INTERNATIONAL to completely cover this giant event. Meet with exhibitors to solve problems and evaluate equipment as a team. Meet with current vendors to evaluate your current equipment and determine how you can become more cost competitive. Bring back key information and contacts your team will need to move ahead quickly after this event.

- CEO, President, Owner
- VP Production
- VP Finance
- Purchasing
- Production Supervisors
- Production Engineers
- Welding Engineers
- Welding/Stamping Supervisors
- Welders
- Prototype and R&D Engineers
- Design Engineers
- Tool & Die Makers

- Tool Room Supervisors
- Quality Managers
- Plant Management
- Robotics and Systems Engineers
- Automation and Information Systems professionals
- NDE professionals

Education You Can Put to Work

MAX INTERNATIONAL educational programs increase knowledge and skills that you can put to work in your business. Choose from short-focused programs where you can drop in on a specific topic as part of your daily show visit. Or, select full-day in-depth programs that will increase your subject mastery. You'll be able to choose from the over 200 different educational presentations detailed later in this brochure.

MAX INTERNATIONAL...The Driving Force at the Core of the Manufacturing Industry

The American Welding Society and the Precision Metalforming Association produce MAX INTERNATIONAL. These two organizations set the fundamental professional standards, practices and technologies that are the core of the manufacturing and fabrication industry. They research and support the techniques and applications that are at the core of our industry.

MAX INTERNATIONAL is dedicated to providing proactive industry leadership. Leadership to help you succeed. Through its almost 800,000 gross square feet of exhibits, leading edge educational programs, and industry sponsors, MAX INTERNATIONAL is driving the changes you must face and understand in order to succeed.

METALFORM

Air Ejection Assembly Machines & Accessories
Associations
Automatic Nut Feeder
Automation in the Press
Beveling Machine
Business Development
Carbides and Ceramics
Clamps/Clamping Systems
Cleaning Systems (Non-Solvent/Aqueous)
Cleaning Systems (Solvent)
Clinching/Fastening Systems
Cluster Coils
Clutches and Brakes
Coated Metals
Coil End Joiners
Coil Handling Equipment
Coil Processing Equipment
Coil Slitting Lines
Coils, Traverse Wound
Computer Hardware and Software
Computer Services
Contract Manufacturer
Conveyors
Coordinate Measuring Machines
Data Collection
Deburring Machinery
Die Coatings and Finishes
Die Components
Die Cushions
Die Handling Equipment
Die Protection Equipment
Die Punches
Die Sets
Die Springs
Drawforming
Engineering Services
Environmental & Industrial Hygiene Products
Fasteners & Related Equipment
Financial Services
Finishing
Forming & Flanging Machines
Galvanized Sheet
Heat Treating
In Press Tapping Mechanism
Insurance
Ion Nitriding
Labeling
Lasers
Levelers

Light Curtains and Safety Equipment
Load Monitors
Loop Controls
Lubricant Applicators/Systems
Lubricants, Forming
Lubricants, Recycling
Machine Monitors
Machinery Mounts
Machinery Moving & Erecting
Machinery, Used
Material Handling Equipment
Measuring & Inspection Equipment
Metal Services
Metals, Aluminum Alloys
Metals, Copper & Copper Alloys
Metals, Cold Rolled
Sheet Steel
Metals, Cold Rolled Strip
Metals, Exotic Alloys
Metal Finishing
Metals, Hot Rolled
Sheet Steel
Metals, Nickel & Nickel Alloys
Metals, Special Products
Metals, Stainless Steel
Metals, Titanium
Nitrogen Die Cylinders
Noise Control Enclosures
Optical Sensing/
Gauging Systems
Parts Straighteners
Part Transfers
Perforating Punches and Dies
Plasma Cutting
Plating Services
Plate Rolls
Press Brakes
Press Controls
Press Counter Balances
Press Counter Balance Controller
Presses, Deep Drawing
Press Feeds
Press Feeds, Electronic
Press Feed Robots
Press Load/Unload Systems
Press Management
Automation
Press Rebuilding
Presses, Bending
Presses, Fineblanking
Presses, Hydraulic
Presses, Hydroforming
Presses, Mechanical
Presses, Pneumatic
Presses, Slide Forming

Presses, Transfer
Presses, Turret
Programmable Controls and Switches
Proximity Switches
Publications
Pulley Machines
Punch & Die Grinders/Sharpeners
Punching Machines and Nibblers
Quick Die Change
Accessories
Quick Die Change Engineering
Robotics & Automation
Roll Forming
Rust Inhibitors
Safety Equipment
Safety Floor Matting
Safety Lockouts
Scrap Buying Specialists
Scrap Choppers
Scrap Processing Equipment
Sensors
Servodrives
Shears
Signature Analysis
Slide Forming & Spring Machines
SPC Gauging
Spin Forming Machines
Straighteners
Tapping Machinery & Equipment
Tool Coatings
Tooling
Tooling, Press Brake
Tool Steels
Tooling, Turret Press
Tooling, Urethane
Training Systems
Tube Bending
Tube and Pipe Processing
Uncoiling/Coiling Equipment
Under-the-Hook Equipment
Valves, Proportional
Valves, Press Safety
Vibration/Noise Control
Products & Machine Mounting Systems
Vision Systems
Waste Treatment & Disposal
Welding Equipment & Supplies
Welding Tool & Die
Wire EDM
Wire Forming Machinery

AWS WELDING SHOW

Abrasive Products
Air Cleaners/Fume
Controllers
Aluminum Welding
Anti Spatter
Compounds
Automatic Voltage
Controls
Backing Materials
Bending & Shearing
Booths & Benches
Brazing
Brazing Alloys (Base
Metals)
Brazing Alloys (Foil)
Brazing Alloys (Powder)
Brazing Alloys (Precious
Metals)
CAD/CAM
Carbon Arc Gouging
Cast Iron
Chemical Products
Clamps, Connectors,
Lugs & Fittings
Computer Software
Consulting
Consumable Welding
Inserts
Controls
Copper/Copper Alloys
Cryogenic Pumps
Cutting Robots
Cutting Tables
Cutting Tips & Fixtures
Cylinder Coatings
Destructive Evaluation
Electrode Holders
Electroslag
Electron Beam
Engines, Gas & Diesel
Exothermic Cutting
Equipment
Face Protectors/
Helmets
Flux (Gas Welding/
Brazing)
Flux (Soldering)
Flux (Submerged Arc)
Flux Cored Wire
(Low/Alloy Steel)
Flux Cored Wire (Nickel
& High Nickel Alloys)
Flux Cored Wire
(Stainless Steel)
Flux Cored Wire (Steel)
Flux Recovery
Equipment
Friction Welding
Fuel Gases
Furnaces
Gas Cylinders
Gas Regulators

Gas Generating
Equipment
GMAW Automatic
GMAW Material
GTAW
Handling Equipment
Hardfacing/Surfacing
(Powder Alloys)
Hardfacing/Surfacing
(Strip Cladding)
Hardfacing/Surfacing
(Wire)
Hardfacing/Surfacing
(Nickel)
Heat Treating/Stress
Relieving
Heating Torches
Inverter Power
Supply/Arc Welder
Ladders/Scaffolding
Laser Beam Cutting
Laser Beam Welding
Markers
Metal Cored Wires
Metalworking
Equipment
Molding Kits
NDE Services
Nickel Welding
Nondestructive
Examination
Numerically Controlled
Equipment
Ovens
Oxyacetylene Welding
Oxyfuel Gas (Manual)
Pipe & Preparation
Pipe Cutting & Beveling
Pipe Welding
Plasma Arc Cutting
Plasma Arc Welding
Plastic Welding
Equipment
Platens
Positioners,
Manipulators
Power Supplies GMAW
Power Supplies GTAW
Power Supplies SAW
Power Supplies SMAW
Protective Clothing
Protective Gloves
Purging Equipment
Research &
Development
Resistance Welding &
Controls
Robots Arc
Robots Resistance
Roll Forming

Saws (Abrasive)
Saws (Mechanical)
Screens, Shields &
Curtains
Sheet Metal Welding
Shielded Gases
Soldering
Soldering Alloys
Spot Welding &
Controls
Stainless Steel Welding
Stamping & Punching
Steel Welding
Storage & Distribution
Equipment
Stud Welding & Controls
Submerged Arc
(Automatic)
Submerged Arc
(Manual)
Technical Training
Temperature Measuring
Instruments
Thermal Spray Wires
Thermal Spraying
Tools (Manual)
Tools (Power)
Tube Bending
Equipment
Ultrasonic Welding
Underwater Welding
Vertical Automatic
Welding
Water Cooling
Equipment
Water Jet Cutting
Water Tables
Weld Joint Tracking
Systems
Weld Seamers
Weld Sensors
Welding Cable
Welding Helmets
Welding Oscillation
Welding Publications
Welding Wire
(Aluminum)
Welding Wire (Copper
Alloy)
Welding Wire (Mild
Steel)
Welding Wire
(Nickel/High Nickel
Alloys)
Welding Wire (Stainless
Steel)
Wire Brushes

THE **DRIVING FORCE** AT THE CORE
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METALFORM EXHIBITORS

as of January 30, 2001

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SERVICES

SUPPLIES

Accra-Wire Controls, Inc.
Acrotech Inc.
Agathon Machine Tools, Inc.
Aida-Dayton Technologies Corp.
AIP Inc.
Airam Inc.
AKH FAS-NER System
Alfe Heat Treating, Inc.
Allegheny Rodney Strip Division
Allis Tool & Machine Corp.
Alma Machinery Company, Inc.
Altair Engineering
AM - Appliance Manufacturer Magazine
Ambi Clutches & Joints Corp.
Amcol Corporation
American Aerostar Corporation
American Nickeloid Company
American Tool, Die & Stamping News
Ametek Patriot Sensors
Anchor Lamina, Inc.
AP&T North America, Inc.
A. Revell Precision Products, Inc.
Arkansas Aeroplex
Armont Machine Repair Inc.
A - S Mfg., Inc.
AssetTRADE.com/AT Operations Inc.
Associated Spring-Raymond
Atlas Technologies Inc.
Attexor Inc.
AutoForm Engineering
Automated Control Systems, Inc.
Automotive Manufacturing & Production
Auto-Sert, Inc.
Bachman Machine Company/Plastics Molding Co.
Ball Machinery Sales Ltd.
BalTec Corporation
Banner Engineering Corp.
BAS Components Inc.
Beckwood Press Company
Benchmark Products Inc.
BesTech Tool Corp.
BHS-Torin, Inc.
Biennaform, Inc.
Bihler of America, Inc.
Bliss Clearing Niagara
Blue Blade Steel
Blue Chip Engineered Products
Bortech Corporation
Brandes Press
BranKamp Process Automation
Break-A-Beam
Brenner Tool & Die Inc.
Brown Boggs
Bruderer Machinery, Inc.
Bunting Magnetics Co.
Can Industry Products (Sequa)
Carbidie
Carbi-Tech, Inc.
Cary Noise Control
C&C Machinery Co.
Cieco, Inc.
Coil Joining Technologies

Colt Automation Limited
Control Electric Company, Inc.
Convergent Prima, Inc.
Corus Metals
Crismor International
Crucible Service Centers
C.U.E., Inc.
DADCO, Inc.
Dallas Industries Inc.
Danly IEM
Days Machinery Movers
Dayton Precision Punch Inc.
Dayton Progress Corp.
Dayton Reliable Tool & Mfg. Company
DCM Tech
Dearborn Crane & Engineering Co.
Dengensha America Corp.
DENN USA, Inc.
Design Tool & Machine Co., Inc.
DE-STA-CO Mfg.-Precision Products
Die Concepts Inc.
Diemakerjobs.com
Die-Tech Manufacturing
Donco Industrial Service, Inc.
Dorner Manufacturing Corporation
Dunkley International Inc.
Dura-Carb Inc.
Durant Tool Co.
Dynamic Feeds, Inc.
Eagle Press & Equipment Co. Ltd.
Eaton Corp. Airflex Division
EBway Corp.
EFD, Inc.
Enerpac Automation Systems
Engineered Lubricants Co.
Enprotech Mechanical Services, Inc.
ESI Group
Euclid Heat Treating
F.D.C. Machine Repair, Inc./RIM of Cleveland, Inc.
FMS MachineTool Distributors, Inc.
Fagor Arrasate S. Coop.
Feed Lease Corp.
Feintool Equipment Corp.
Felton Brush Inc.
Femco Machine Company
Ferguson Metals, Inc.
F & G Multi-Slide/F & G Tool & Die Fibro Inc.
Finn-Power International, Inc.
FlexArm
FlexSpray Lubrication Systems, Div. of Metric Equipment Co., Inc.
Foremost Machinery Corp.
Forming Technologies, Inc.
Formtek Group
Forward Industries
Fotofab
Fuchs Lubricants Co.
General Physics Corporation
GERB Vibration Control Systems, Inc.
Global Shop Solutions, Inc.
GMT Corporation

Gold Star Coatings/H B Carbide Co.
Gordon Engineering Corp.
Grand Rapids Machine Repair, Inc.
Greenerd Press & Machine Co., Inc.
GSW Press Automation Inc.
Guardian Metal Sales, Inc.
Gudel-Rapindex
Guild International Inc.
Haeger, Inc.
Hamilton Precision Metals Inc.
Hansford Mfg. Corp.
Hartup Tool, Inc.
Hayden Machinery Co., Inc.
HBE Engineering, Inc.
Heim Group
Helm Instrument Company
Herion USA Inc.
H H Sumco Inc.
Hilma Div. of Carr Lane Roemheld
Hi TecMetal Group
HMS Products Co.
Holsman Corporation
Humdinger, Inc.
Hurco Autobend Systems
Hutchison Tool Sales Company
Hyson Products
I. C. Fluid Power, Inc.
IDC Corporation
IMCO International Ltd.
Ing Yu Precision Industries Co., Ltd.
InLine Cleaning Systems Div. C-Tech
Innovative Carbide, Inc.
International Chemical Co.
International Smart Sourcing
Intricate Grinding & Machine Specialties
ISB
ITUX/Jose Iturraspe S.A.I.C.
JENFAB
Jesco Industries Inc.
JobBoss from Kewill
Jumpsource
Kaman Instrumentation Operations
Kamco, Inc.
Kent Corporation
Kentucky Economic Development Team
Komatsu
Kosmek Ltd.
KTI Technologies, Inc.
Lane Punch Corporation
Lapham-Hickey Steel Corp.
Lauffer/Europress Metalforming Tech.
Leander Lubricants
Leico U.S.A. Corporation
Lempco Industries, Inc.
Lens Savers Division of International Crystal Laboratories
Liberty Mutual Group
Lightning Time Savers
Linear Transfer Systems Ltd.
Link Systems
Littell
LSP Industries, Inc.

LuBo Industries, Inc.
M & M Metalforming Machinery, Inc.
Macrodyne Technologies Inc.
Magnum Press Automation
Manufinish.com
Manzoni North America, Ltd.
Master Finish Co.
Mate Precision Tooling
Mazak Nissho Iwai Corp.
MDL Mold & Die Components Inc.
MetalForming Magazine
Metal Mates, Inc.
Metal Trades Inc
Michigan Manufacturers Service
Midland Tool & Design
Mid-State Chemical & Supply Corp.
Midwest Brake
Milwaukee Punch Corporation
The Minster Machine Company
Mitsubishi Laser
MJC Engineering & Technology, Inc.
Mocap, Incorporated
Moeller Manufacturing Co.
MP Components
Muller Weingarten Corporation
Multi-Arc Inc., a Berna Group Co.
MW Industries
Nautilus Processing Systems, Inc.
Neff Press, Inc.
New London Engineering
Norlok Technology Inc.
Norwalk Innovation, Inc.
Oakley
Oak Products, Inc.
Oberg Industries
Optima USA, Inc.
Orchid Automation
Orii Corporation of America
Orttech Inc.
P/A Industries
Parker Rust-Proof of Cleveland
Pascal Engineering Inc.
Pax Products, Inc.

DTI Peer
Penn Engineering & Manufacturing Corp.
Penn United Technology, Inc.
Pepperl + Fuchs, Inc.
Perfecto Industries
Pilz Automation Safety L.P.
Piranha
Pivot Punch Corp.
Plansee Tizit
Polar Inc.
Porter Precision Products Company
Positive Safety Mfg. Co.
Powder Coating Institute
PPG Industries
PPT VISION
Prab Inc.
Precision Industries Corporation
Precision Punch Corporation
Precision Specialty Metals
Precision Steel Warehouse
Preferred Capital, Inc.
Presse Ross
Pressmation Inc.
Press Room Equipment Co.
Pressure Island
Prime Advantage Corporation
Principal Manufacturing Corporation
Proceco Ltd.
Product/DIECO LLC
Progressive Tool Company
PTS Welding Technologies
Q. C. Industries, LLC.
Rapid-Air Corporation
RAS Systems, LLC
RD Sales Inc.
Ready Technology, Inc.
Rees Inc.
Reich Tool & Design Inc
Renaissance Business Systems, Inc.
RIMS Fastening Systems LLC
R & J Rigging, Inc.
Rockford Systems Incorporated
Rockwell Automation
Roland Industrial Electronics L.P.
Ross Controls
Royal Diversified Products, Inc.

Sankyo America, Inc.
Savage Hydraulic Press
Schmid Corporation of America
Schuler U.S. Headquarters
Self-Lube
Seyi-America, Inc.
Shinohara-Marubeni Machine Service Co.
SICK, Inc.
Signature Technologies, Inc.
Skill Tool & Die Company
Smedberg Machine Corporation
T. J. Snow Co., Inc.
Solid Edge-Unigraphics Solutions
Solar Atmospheres Of Western PA
SOMA
SPRA-RITE Inc.
South Bend Lathe
Southern Machinery Repair, Inc.
Specialty Strip & Oscillating, Inc.
Speedycut Tapping Machines, Inc.
Stainless Sales Corporation
Stamtec Inc.
Stamtex/Div. of Metal Products
Standfast Industries, Inc.
The Steel Company Group
Steel Warehouse Co., Inc.
Steinel Normalien, Div. of Precision Resource
Storch Magnetics
Striker Systems
Strilich Technologies Inc.
Stripco Inc.
Superior Die Set Corp.
Superspin Inc.
Sutherland Presses
Syr-Tech Inc.
Sytech Engineering Inc.
Kenco Press, Div. of Taber Ind.
TAK Enterprises, Inc.
Talarico Inc.
Tamer Industries
Tapco International
TCT Stainless Steel Inc.
TD Center
Tech Machinery Sales
Technical Materials Inc.
Tecknow Education Services, Inc.

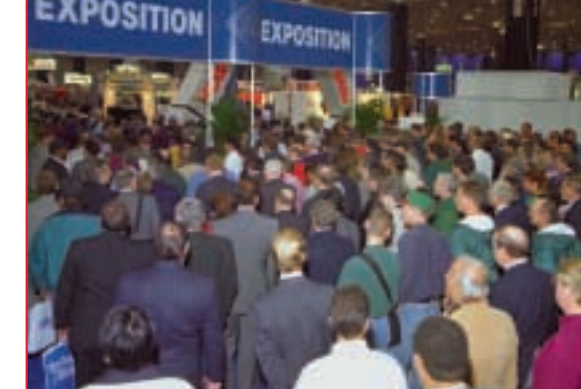
Texaco Lubricants/Shell Lubricants
Timesavers, Inc.
Timken Latrobe Steel Distribution
Tippco Punch Inc.
Toledo Press Company
Toledo Transducers, Inc.
Topper Industrial
Torque Technologies, Inc.
Tox-Pressotechnik
Triad Controls Inc.
Tribco Inc.
Tru-Chem Co., Inc.
Tru-Cut, Inc.
Trumpf Inc.
Tru-Tech Tool and Machine Corp
TTS
Turck, Inc.
Ulbrich Stainless Steels & Special Metals, Inc.
UNICO, Inc.
Unisorb, Inc.
Unist, Inc.
United Aluminum Corp.
United Machine Corporation
Unittool Punch & Die Co.
U.S. Baird Corporation
Vibro/Dynamics Corporation
VIL
Virtek Vision International Inc.
VisionMark, Inc.
Vista Metals, Inc.
Waddington Electronics Inc.
Wardcraft Conveyor & Quick Die Change
Wayne Trail Technologies, Inc.
Wendt & Sons
Whistler, S. B., & Sons, Inc.
W & H Stampings & Fineblanking
Wichita Industrial Clutch Products
M. S. Willett, Inc.
Wilson Tool International
Wintriss Controls Group of Honeywell
Yamada Dobby USA Corp.
Zapp USA Inc.



THE **DRIVING FORCE** AT THE CORE
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AWS EXHIBITORS

as of January 30, 2001



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3M
ABB Flexible Automation, Inc.
Abicor Binzell
Abmast Abrasives Corporation
ACD
Advanced Fabricating Machinery
Advanced Kiffer Systems, Inc.
Advanced Measuring Systems
AerVOE-Pacific Co., Inc.
Affinity Industries, Inc.
AGA Gas, Inc.
Air Cleaning Systems, Inc.
Air Products & Chemicals, Inc.
Air Quality Engineering
Airflow Systems, Inc.
AIRGAS, Inc.
Alcotec Wire Corporation
Allied Flux Reclaiming / Harbert s
Products, Inc.
Alphatex Company
American Cap Company
American Chowel Industries, Inc.
American Filler Metals Company
American Fortune Company
American Laser Spares
American Saw & Manufacturing
Company
American Torch Tip Company
American Weldquip, Inc.
AMET, Inc.
Ampco Metal, Inc.
Anderson Cutting Systems
Anderson Products
Anglo American Enterprises Corp.
Anval, Inc.
AOQC Moody International, Inc.
Applied Robotics Inc.
Arc Machines, Inc.
ArcOne
Arcsmith
Arctech Welding Electrodes &
Wires
Armstrong-Blum Manufacturing
Company
ATI Industrial Automation
Atlas Welding Accessories, Inc.
Auburn Manufacturing, Inc.
Aufhauser Corporation
Bear Paw Magnetic Tools, Inc.
Beijing Advanced Metal Materials
Bluco Corporation
BMS, Inc.
BOD Weld-Cut Industry Co., Inc.
Bohler Thyssen Welding, USA, Inc.
Bonaf Technologies, Inc.
Bore Repair Systems, Inc.
Bosch Automation Technology
BOSS Manufacturing Company
Bradford Derustit Corporation
Bren, Inc.
Broco, Inc.
BTU Contracts, Inc.
Bug-O Systems / Cypress Welding
Burr King Manufacturing Co., Inc.
C M W, Inc.
C-Spec
C&G Systems
C.G.W. Abrasive Manufacturing,
USA
C. H. Symington & Co.
Caldwell Group, The
Canadian Welding Bureau
Carborundum Abrasives North
America
Carris Reels, Inc.
CEBORA Spa

Cemco, Inc.
Centerline (Windsor) Ltd.
Ceodeux, Inc.
Cerbaco Ltd.
Champion Welding Products
Chart, Inc.
Chem Clean Corporation
Chosun Steel Wire Company
Chung I Silver Solder Co., Ltd.
C-K Worldwide
Cleveland Steel Tool Company
Cloos Robotic Welding, Inc.
COB Industries, Inc.
Codeware
Colorado School of Mines
Comeq, Inc.
Computer Engineering, Inc.
Computer Weld Technology, Inc.
Computers Unlimited
Conam Inspection
Contour, div. of Jackson
Products, Inc.
Contract Fusion Inc.
Controls Corporation of America
Cooper Tools
Cooptim, Ltd.
Corex
Cor-Met, Inc.
Crouse-Hinds Molded Products
Cryogas International
Cryostar, USA
CTR, Inc.
Cypress Welding Equipment
D. L. Ricci Corporation
Daihen, Inc.
Daloz Safety
Darco Southern, Inc.
Dataweld Incorporated
Del Liftgates, Inc.
Delmia Corporation
Deprag Industrial
DE-STA-CO Industries
Direct Wire and Cable
Divers Academy
Doringer Cold Saws
Dovatech, Ltd.
Dynabrade, Inc.
Dynaflux, Inc.
E. H. Wachs Company
E. G. Heller s Son, Inc.
Eagle Bending Machines, Inc.
Edax, Inc.
Edison Welding Institute
Edwards Manufacturing Company
Eldec Induction USA, Inc.
Elderfield & Hall, Inc.
Electric Controls and Systems, Inc.
Electric Heating Systems
Electro-Max Manufacturing
Company
Electron Beam Technologies, Inc.
Elocab Tailor-Made Cables
Encompass Group
Environmental Air Solutions, Inc.
Equotip Assoc.
Ercolina-CML, USA
Erico, Inc.
ESAB Welding & Cutting Products
ESCO Tools
eSprocket
ESSEN Welding Fair 2001
ESSEX Group, Inc.
Eureka Welding Alloys
Evergreen Midwest Company
Expansion Seal Technologies
Factory Cat

FEMI S.R.L.
Ferris State University
FHP Elmotor AB
FIBA Technologies, Inc.
Fibre-Metal Products Company
Fischer Engineering Company
Flame Technologies, Inc.
Flange Wizard Tools
Flexovit USA Inc.
Flowdrill Inc.
Frommelt Machine Guarding
Products
Frommelt Safety Products
FSX, Inc.
Fusion, Inc.
Galt Technical Services, Inc.
Garryson, Inc.
Gasflux Company, The
Gateway Amsafe, Inc.
Gedik Kaynak Sanayi ve Ticaret
A.S.
Genesis Systems Group
Genstar Technologies Co., Inc.
George Fischer Pipe Tools
Goss Incorporated
GOW-MAC Instrument Company
Griffin Automation, Inc.
Gross Stabl Corporation
G-Tec Natural Gas Systems
Guard-Line, Inc.
Gulf Wire Corporation
Gullico International, Inc.
H & H Sales Company, Inc.
H & S Tool
HACO-Atlantic, Inc.
Harris Calorific
Harris Welco div. of J. W. Harris Co.
Hawkins Metalworks
Haynes International, Inc.
HE & M Saw
Heath, Michelle & Andy
Heck Ind.
Hi Temp Global Marketing, Inc.
High Test Industries Corp.
Hiico Carbon Composites, Inc.
Hobart Filler Metals
Hobart Institute of Welding
Technology
Hobart Welding Equipment
Hornell, Inc.
Hougen Manufacturing Company
Hyd-Mech Saws
Hydropedes Insoles
Hypertherm Inc.
IBEDA Superflash Compressed
Gas, Equipment Div.
IGUS, Inc.
IMAX Industries, Inc.
Impact Engineering, Inc.
Inco Alloys Int., IAI
Industrial Laser Solutions
Industrial Machine Trader
Industrial Machinery Digest
Industrial Market Place
Inertia Friction Welding, Inc.
Innerlogic, Inc.
Intercon Enterprises, Inc.
Intertech Systems, Inc.
Invincible Airflow Systems
Inweld/Natweld Corporation
IPR Automation
IRT-Scanmaster Systems, Inc.
ITW Dyken/Dymon
ITW Mark-Tex Corporation
ITW Welding Products Group
J & S Machine, Inc.

J. Walter, Inc.
Jackson Products, Inc.
James Morton, Inc.
Jancy Engineering Company
JAZ USA, Inc.
Jepson Power Tools
Jet Wheelblast Equipment
Jetline Engineering, Inc.
Jinan Metal Material
Manufacturing Co., Inc.
Joseph A. Thomas, Ltd.
K & K Welding Products
Kawasaki Robotics, Inc, USA
Kayo Products Co., Ltd.
Kemper USA, Inc.
Kinco International, Inc.
Kobelco Welding of America,
Inc.
Kohler Company-Engine Div.
Koike Aronson, Inc.
Kokuho Company, Ltd.
Koolant Coolers, Inc.
Korea Welding Industry
Cooperative
Krautkramer, Inc.
LA-CO Industries
Lantek Systems, Inc.
Larco, Inc.
Lasag Industrial Lasers
Laser Machining, Inc.
Lenco, Inc. D\B\A NLC, Inc.
Liburdi Dimetrics Corporation
Liburdi Engineering Ltd.
Liburdi Puls weld
Lincoln Electric Company
Lippo International, Inc.
Lockheed Martin Michoud
Space Systems
LS Industries
M. Braun, Inc.
Machine Tech, Inc.
Mack Products Company
Magestic Systems, Inc.
Magnaflex
Magnatech Limited Partnership
MAN - Modern Application
News
Mannings U.S.A., Inc.
Manufacturing Technology, Inc.
Maryland Brush Company
Mathey Dearman, Inc.
Mauritron, Inc.
McKay
Merit Abrasive Products, Inc.
Metabo Corporation
Metal Processing Systems, Inc.
Metal-Mizer
Metorex, Inc.
Midalloy, Inc. (Formerly
Midwest Alloys & Tech.)
Miller Electric Manufacturing
Milwaukee Electric Tool Corp.
MIM Industries, Inc.
Mitsubishi Materials U.S.A. Corp.
Miyachi
MK Products, Inc.
Moore Industrial Hardware
Motoman, Inc.
MQ Power Div. of Multiquip
Nasco
National Standard Company
Navsea Carerrock
Navy Joining Center

Nederman, Inc.
Nelson Stud Welding
Nettis Environmental Ltd.
Nickel Development Institute
Nippert Company, The
Nissen Company, J. P.
Niton Corporation
Nitto Kohki USA, Inc.
NK Co., Ltd.
Non Destructive Testing Group
Norris Cylinder Company
Norton Company Abrasives
NSL Analytical Services, Inc.
NTT
Nuova Kiwi
O.E. Meyer Company, Inc.
OBO Bettermann Stud Welding
Oetiker, Inc.
Ohio Nut & Bolt Co., The
OKI International
Omniturn
Onan Corporation
Osborn International
Osram Slyvania
Otos Optical Company, Ltd.
Owens Community College
Oxo Welding Equipment
Company
Oxylance Corporation
Pacific Aerospace &
Electronics, Inc.
Pac-Mig, Inc.
Panametrics, Inc.
Panasonic Factory Automation
Company
Pandjiris, Inc.
Pangborn Company
Parweld, Inc.
Pat Mooney, Inc.
Paton Welding Institute
Pearl Abrasive Company
Peddinghaus Corporation, Tool
Division
Permadur Industries, Inc.
PFERD Inc.
Phoenix International
Photonics Spectra
Pietro Galliani SPA
Pillar/Cycle-Dyne
PIP Company
Pipemaster Tools
Plymovent Corporation
Polymet Corporation
Postle Industries, Inc.
Praxair, Inc.
Presto Lifts, Inc.
Preston-Eastin, Inc.
Prince and Izant Company
Production Machinery Inc.
Profax
Project Tool & Die, Inc.
Promau s.r.l.
Protem U.S.A.
Proteus Industries
Pulse Puddle Arc Welding
Punch Press-Metalworkers
Market Place
Quality Components
Company
Radyne Corporation
Ramstud USA, Inc.
Rankin Industries, Inc.
Ransome Company

Reading Technologies, Inc.
Reis Robotics
Resistance Welder
Manufacturers Association
Resistance Welding Products
Revco Industries, Inc.
Rex-Cut Products, Inc.
Robot Worx
Rodman & Company, Inc.
Roman Manufacturing, Inc.
Ronic Weld Systems, Inc. /
Nimak
Saf-T-Cart
Schwarzoph Technologies
Corporation
Sciaky, Inc.
Scotchman Industries, Inc.
Seal Seat Company (div. of
Lincoln Electric)
Segro/Colonial Abrasives
Selectrode Industries, Inc.
Sellstrom
Semtorq, Inc.
Sensolve, Inc.
Servo-Robot, Inc.
SGS Tool Company
Sherwin, Inc.
Sigmatek Corporation
SKM Industries, Inc.
Smith Equipment
Southwestern Illinois College
Spanco, Inc.
Spectronics Corporation
Stanco Manufacturing, Inc.
Stein - USA
Steiner Industries
Stellite Coatings, Inc.
Stoody
Stork-Herron Testing
Laboratories, Inc.
Stress Tel
Sumner manufacturing
Company, Inc.
Superheat Services, Inc.
Superior Flux & Manufacturing
Superior Products, Inc.
Swagelok Company
Systematics, Inc.
T.C. Service Company
Tanaka Laser
Taylor Winfield Corporation
Tec Torch Company, Inc.
Tech Group
Techalloy Company, Inc.
Techniweld Alloys & Welding
Supplies
Techweld, Ltd.
Tecnar Automation Ltd.
Tempil an ITW Company
Tensile Testing Metal Lab
Texas State Technical College
Thermacut (Tatras)
Thermadyne Holdings
Thermal Arc
Thermal Dynamics
Thermco Instrument
Corporation
Thermo Measure Tech
Thermographic
Measurements, Inc.
Thomson Industries
Tillman Company, John
Titanium Wire Corporation

TOCCO /FECO
Tomco Equipment Company
Trafimet USA, Inc.
Tregaskiss Ltd.
Trendex Information Systems, Inc.
Tri Tool, Inc.
Trimark
Trion Inc.
Triple Crown Products, Inc.
Trumpf, Inc. - Laser Technology
Center
Trystar Cables
TWI-The Welding Institute
Tweco/Arcair
Tyrolit North America, Inc.
Uncommon USA
Unibraze Corporation
Uni-Hydro, Inc.
United Abrasives, Inc.
United Air Specialists, Inc.
Unitol Electronics, Inc.
Universal Flow Monitors, Inc.
Universal Metalworking
Equipment
Uni-Wash/Polaris Ind.
Ventilation Group
Uniweld Products, Inc.
Utah State University
Uvex Safety, Inc.
Vacuum Atmospheres
Valtra, Inc./Good Hand, Inc.
Victor Equipment
Virginia Gloves
Wall Colmonoy Corporation
Washington Alloy Company
Watteredge-Uniflex, Inc.
Weartech International, Inc.
Weber Corp., Hans
Weiler Corporation
Weld Engineering Company, Inc.
Weld Mold Company
Weld Motion, Inc.
Weld Systems Integrators, Inc.
Weld Systems International, Inc.
Weld-Aid Products
Weldas Company
Weldcoa
Welders Mall.com, LLC
Welding Alloys USA, Inc.
Welding Design & Fabrication
Welding Direct.com
Weldmatic, Inc.
Weldsale Company div. of
J.A.Cunningham Equip.
Weldship Corporation
Weldtech
Weldwire Company
Wentgate Dynaweld, Inc.
Western Enterprises
White Engineering Surfaces
Corporation
Whitstone Corporation
Wilson Industries, Inc.
Wilton Tool Group
Wing Enterprises, Inc.
Winter, Inc. & Co., F. W.
Wisconsin Wire Works, Inc.
WNI
World Machinery & Saw
Systems Company
Worthington Cylinders
York sales Company
Young Do Ind. Co., Ltd.

Your educational registration enables you to attend these programs. See registration form for details.



Join PMA and AWS as they present

HARLEY-DAVIDSON DAY

May 10, 2001
at the I-X Center

South East Harley-Davidson, Northeast Ohio's largest Harley dealer, will be featuring an exciting collection of their most popular motorcycles. Come all week to view the Harley booth. Thursday is HARLEY-DAVIDSON DAY where, by attending, you'll have a chance to win valuable Harley merchandise. You must be in attendance to win.



COME SEE CAR & DRIVER at PMA's Booth

Kenny Phillips, of Wakeman, OH, will tackle the 2001 American Speed Association (ASA) ACDelco Series in the #12 Monte Carlo. Kenny is a veteran of the Midwest short tracks, having won nearly 100 races in a variety of divisions. The 2001 ASA ACDelco Series races will be broadcast live on The National Network. Car and driver are sponsored by CRS Registrars Inc., Toledo, OH. (Providers of ISO QS 9000 Registration Services.)

WEEK AT A GLANCE

STAMPING
FORMING
WELDING
CUTTING
JOINING
ROBOTICS
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PIPE/PLATE
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SUPPLIES

	HOURS		AWS SOCIETY	AWS FULL-DAY SEMINARS		AWS PROFESSIONAL PROGRAM	INT'L BRAZING & SOLDERING CONFERENCES	WELDING EDUCATORS	FREE SESSIONS
SUNDAY	Registration Symposium 11am - 5 pm Expo 11 am - 5 pm Expo Hours Noon - 5 pm	11:45 am Opening Ceremony for MAX INTERNATIONAL	9 - 11 am Opening session, AWS 82nd Annual Meeting 6 - 8 pm Reception for AWS members & invited guests	8:30 am - 4:30 pm Corrosion of Welds Causes and Cures Inspection to the 2000: D1.1 Code					
MONDAY	Registration Symposium 7am - 5 pm Expo 8 am - 5 pm Expo Hours 9 am - 5 pm	PMA SYMPOSIUM 8 am - Noon Tool & Die Maint. Fund. of Press Tech. Material Handling Management Deep-Draw Stamping Roll Forming	7:30 - 8:30 am AWS Prayer Breakfast Noon - 2 pm AWS Awards Luncheon	8:30 am - 4:30 pm What Pros Need to Know About Metallurgy Arc Welding and Power Sources		9 - Noon Laser Welding Part 1 Stainless Steel Part 1 Modern Process & Control Methods 2 - 5 pm Resistance Welding Process Optimization		2 - 5 pm Installing, Maintaining & Verifying Your Charpy Impact Machine What You Need to Know About Safety & Health Issues in the Welding Environment	
TUESDAY	Registration Symposium 7am - 5 pm Expo 8 am - 5 pm Expo Hours 9 am - 5 pm	8 am - Noon Tool & Die Design Press Technology Basic Electronics Environment & Safety Transfer Stamping Slide Forming		8:30 am - 4:30 pm Road Map through the D1.1 Code		9 - Noon Arc Welding Processes Modeling and Distortion Stainless Steel Part 2 2 - 5 pm Laser Welding Part 2 Weldability Testing Modeling of Welding Processes	2 - 5 pm BS1 Applied Brazing Developments	9 - Noon E1: General Education Programs Update 2 - 5 pm E2: Titanium	2 - 5 pm Act 1 Sheet Metal Welding Act 2 Friction Stir Welding
WEDNESDAY	Registration Symposium 7am - 5 pm Expo 8 am - 5 pm Expo Hours 9 am - 5 pm	8 am - Noon Quick-Die Change Advanced Electronics Environment & Safety Material Handling Metal Fabricating Hydroforming		8:30 am - 4:30 pm Design & Planning for Cost-Effective Welding Welding of Stainless Steels (the basics)		9 - Noon Aluminum Metallurgy Hydrogen in Welds Microstructure & Properties of Some Unique Weldments 2 - 5 pm Friction Welding & Solid State Processes Hydrogen Cracking	2 - 5 pm BS2 Brazing Research & Applications	1 - 5 pm Demonstration for Welding Educators	2 - 5 pm Act 3 Laser Technology Act 4 Process Optimization
THURSDAY	Registration Symposium 7am - 3 pm Expo 8 am - 3 pm Expo Hours 9 am - 3 pm 	8 am - Noon Quick-Die Change Progressive Tooling Sheet-Steel Fundamentals Near-Zero Auto Stamping Intelligent-Resistance Weld Training & Resources		8:30 am - 4:30 pm Welding of Stainless Steels (Avoiding Weld Defects) Why & How of Welding Procedure Specifications		9 - Noon Non-Ferrous & Intermetallic Alloys HSLA Steels			

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TRACK 1

TOOL & DIE MAINTENANCE

Achieving Longer Tool Life

Nick Tarkany
Director Technical Education & Research
Dayton Progress Corp.

Solve many of your die maintenance challenges by learning from this preventative approach to punch and die maintenance. You'll get great ideas for extending tool life and learn effective techniques to continue to improve your operations. Identify die maintenance failures, evaluate tool steel grades and explore scheduling methods.

Using Ultra-High-Strength Steel Sheets

Berne Högman
Engineer, Cutting Technology
Uddeholm Tooling AB

More and more car body parts are being made of thinner, but stronger sheet steel to reduce fuel consumption and emissions while meeting critical safety requirements. Learn about effective tooling techniques for working in ultra-high-strength steel sheet, and key properties of tool steels, work material and coatings.

Proper Lubricant Selection

Rick Klann
Division Manager
Fuchs Lubricants Co.—Franklin Division

Selecting the proper lubricant for the job can have a significant effect on tool performance. Learn how various lubricants are formulated and what key variables in the production process are used to determine lubricant requirements. You'll review the various types of lubricants, how they perform and why they sometimes don't work.

Nitrogen-Gas Springs and Manifold Systems

Andy Buchfellner
Customer Service Manager,
Engineered Products
Hyson Products, Associated Spring

Learn new techniques for the repair and maintenance of nitrogen-gas spring and manifold systems. Gain an understanding of how preventative maintenance can increase longevity and reduce downtime of nitrogen-gas spring and manifold systems. New advancements in gas spring technology will be covered.



TRACK 2

FUNDAMENTALS OF PRESS TECHNOLOGY

Press Selection for Stamping Process Improvement (2 Hours)

Denny Boerger
Product Manager
Aida-Dayton Technologies Corp.

Properly selecting a press is critical to the profitable production of stamped parts. Gain an understanding of the basic principals that apply to all mechanical presses. Learn about tonnage, energy, clutch torque, drive systems and the type of press frames that are available and how to best apply the many variations to your stamping operation.

Pressroom Electronics Technology (2 Hours)

Dick LaBelle
Manager North America Sales
Honeywell Wintriss Controls Group

The extensive role that electronics play in today's pressroom environment will be addressed. Learn about the operational benefits of clutch/brake control, programmable timing, die-sensing systems and load analysis. Management reporting and integrated systems will also be covered.



TRACK 3

MATERIAL HANDLING

Coil-Line Considerations

John Remington
Product Manager
The Minster Machine Co.

Increase coil-line productivity by learning how to implement the latest technologies. Coil application problems and their solutions will be presented. Learn how to interpret loop parameters and the effect of the loop on payoff and feeding coils. Also, gain an understanding of the type of equipment used for coil payoff and feeding.

Automatic Coil-Fed Press Production System

Ted Sberna
Consultant
Applied Engineering Concepts

Setup of the timing functions relative to press and die parameters is often misapplied in progressive, blanking and transfer operations. Understand how to use press-timing diagrams to establish feed angle, pilot pins, and press-stopping time. Calculating maximum capable safe-production speeds and profiling of press-feed systems will be explained.

Strip Shape for Consistent Quality

Eric Theis
Principal Consulting to the Industry

The basic types of flattening and leveling equipment will be explained. A comparative analysis of blanks or parts leveling versus coil leveling. Gain an understanding of how to apply the various types of equipment in the production line and how to operate it for optimum efficiency.

Using Decoilers to Slash Downtime

Johnnie Jones
CEO
Accra-Wire Controls Inc.

Even a minor change in OD or ID will have a major impact on the type of decoiler to use for the job. Downtime can be slashed and productivity dramatically increased through proper utilization of coil-handling methods. It will be shown how pallet decoilers offer significant advantages over traditional coil-handling methods.



TRACK 4

MANAGEMENT

Locating, Hiring, and Retaining Tool & Die Professionals

Dave Buddecke
Principal
Kelsar Resources, LLC

Explore new and traditional resources for locating, hiring and retaining toolroom personnel. Evaluate key industry trends in employment and retention, assess the needs and expectations of mature employees, and discuss attributes of "Generation X" and the new "Generation Y" employees now entering the workforce.

Implementing an E-Commerce Program

Dave Lechleitner, Lead Trainer
Kewill Erp Inc./JobBoss Software

How small job shops can capitalize on e-commerce. The unique requirements of job shops and the effective strategies used by one manufacturer to implement a very successful e-commerce program despite limited resources, a small budget and short leadtime will be illustrated.

B2B QS 9000 Compliments E-Commerce

John Cachat, President
IQS Inc.

Developing an effective "supply chain" will involve more than just communicating schedules and coordinating shipping notices. Learn how using Internet-based tools for electronic-data interchange of ISO 9000/QS 9000 transactions will enable organizations to encompass product development, planning, engineering, prototype, and inspection results.

Manufacturing and E-Commerce

Greg Mesaros
Founder and CEO
eWinWin

Why should you be concerned about e-commerce? The importance of e-commerce in today's manufacturing environment will be evaluated. The pros and cons of auctions, catalogs, vertical exchanges and demand aggregation will be covered. Decide on an e-commerce strategy that's right for your company.



TRACK 5

DEEP-DRAW STAMPING

Full-Cycle Control in Draw Operations

Kenneth L. Smedberg, President
Smedberg Machine Corp.
Jan Orlan, Large Die Specialist
Ford Motor Co.

New solutions for stretch-draw applications will be presented. The benefits that can be realized through automation and the reduction in sheet metal usage will be illustrated. Learn how draw operations can be significantly improved by reducing part damage, minimizing scrap and controlling stroke tonnage.

Proven Draw-Die Practice (2 Hours)

Art Hedrick
Corporate Training Director
Synergis Technologies Group

Gain a better understanding of the key factors to consider when designing, building or trouble shooting deep-draw-stamping dies. Topics such as understanding draw ratios, metal-flow principles, pressure requirements, draw beads, draw bars, standoff, and circle-grid analysis will be covered.

Add Flexibility to Your Mechanical Press in Producing Formed and Drawn Parts

Paul Pfundtner
CEO
Red Stag Automation

Learn how hydraulic cushions are being installed on large mechanical presses for a fraction of the cost of purchasing a complete, new hydraulic-press system. These modifications provide the operator the ability to vary the resistive force within the press resulting in parts produced without fracturing, gulling, or orange peeling.



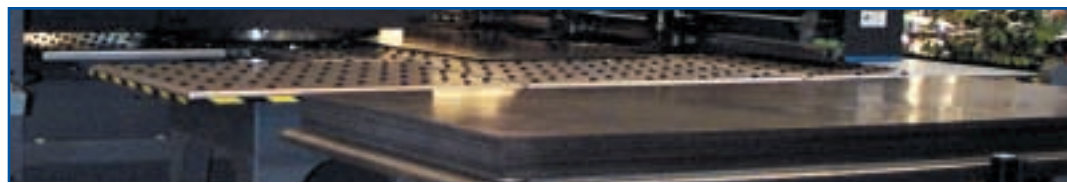
TRACK 6

ROLL FORMING

Effective Operation of Roll-Forming Machines

Ronald D. Czerski
President
NAMES Group

Machine operators must become more knowledgeable of the overall roll-forming process if they are to optimize efficiencies introduced by computer design of tooling. Learn how advances in roll design can lead to reduced downtime and improved quality at the machine. The principles of roll forming—its capabilities and limitations—will be addressed.



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Monday 8 am - Noon continued

Integrated Roll-Forming Systems with Manufacturing Cells

Charles T. Lutes
Vice President of Engineering
Roll Forming Corporation
John Montgomery
Sales Engineer
Roll Forming Corporation

The advantages of integrating various manufacturing and assembly operations into a single roll-forming system will be outlined. The importance of conducting up front design and engineering functions to eliminate downstream processing problems will be discussed. Keys for successfully performing cellular manufacturing and value-added operations in roll forming.

Roll Forming: Revolutionary Developments

Paul Schlumpberger
General Manager
American Machine

New technology developments from around the world and their specific application for improving the roll-forming process will be presented. Gauge control, hydraulic-linking systems on presses, and electrically-actuated cutoffs will be introduced. Leading-edge rotary technology used on light- or heavy-gauge products will also be covered.

Minimizing Production Problems in Roll Form Tooling Design

Chuck Summerhill
Engineering Coordinator
Form-Kraft Inc. Division of Roll-Kraft

Part quality problems are generally universal in nature and numerous factors must be considered when solving them. Common roll-forming problems—particularly end flare and multi-gage/tight tolerance production—and the design solutions that will improve product quality, ease of set up, and tooling performance will be covered.



TRACK 1

TOOL & DIE DESIGN

Non-Conventional Progressive-Tool Designs

Steve Czapl
Tool Engineering Supervisor
Weiss-Aug Co. Inc.

Complicated product assemblies and automation techniques require that stamped parts be made with greater accuracy. Today, dimensional capability has become a greater concern than functional part tolerances when challenged by modern manufacturing systems and processes. Learn alternative design methods for complex progressive-stamping tools.

Software for Die-Face Design

Dr. Waldemar Kubli
President
AutoForm Engineering GmbH

It typically takes a designer several days or even several weeks to create the binder and addendum in a CAD system for simple to complex dies. Since this process has to be done manually it is very time consuming. Learn about new software that automatically allows die designers to create an initial design of a stamping die in just a few hours.

Tools for Die Alignment

John Dedic
Marketing Manager
Danly IEM

Learn about various options for precision alignment of dies. From dowels to friction pins and bushings to high-composite materials. The basic tools available for achieving precise alignment of the die, when to use them and the cost savings that result from their use will be reviewed.

Die Steels with High-Wear Properties

Edward Tarney
Director of Technology
Crucible Service Centers

Traditional tool and die steel selection has required sacrificing wear properties in order to gain toughness. Die steels that exhibit a high level of toughness without sacrificing other important characteristics will be featured. Methods for evaluating performance including the use of failure analysis in guiding tool selection will be covered.



TRACK 2

PRESS TECHNOLOGY

Effects of High-Tensile Stamping

Patrick Ontrop
General Manager, Sales
The Minster Machine Co.

Gain an understanding of the effects of high-strength, low-alloy steels on press equipment and how the user can minimize any problems. Specific areas of focus will be the effect of high-tensile material on press dynamic loading, snap through, unbalanced press loading, and press deflections.

Achieving Higher Performance from Gap-Frame Presses

David J. Stone
Stamping Consultant
Amada America, Inc.

Today's new gap-frame press technology will be explored including a link-motion feature that can offer significant increases in production and part quality. Bridge-frame structure presses, their characteristics and benefits along with the competitive benefits of operating robotic presses and loaders will be addressed.

Increasing Productivity with Hydraulic Presses

John David Murphy
National Sales Manager
Neff Press Inc.

The basic features and advantages of hydraulic presses will be addressed. How hydraulic presses can increase productivity and part quality in an ergonomically sound manner will be covered. The application of hydraulic-press technology will be illustrated using specific production examples.

The Hydraulic Press: Controls and Technology

David P. Sullivan
Sr. Application Engineer
Rockwell Automation

Hydraulic presses are becoming increasingly popular. Their flexibility, performance and cost make them an attractive alternative to mechanical presses. Learn how hydraulic presses are effectively being used in tandem lines, die try-out, and hydroforming operations, and how advances in electronic-control technology enables the press to operate faster and safer.



TRACK 3

BASIC ELECTRONICS

Understanding Sensors and Their Application

Jim Finnerty
Product Manager
Honeywell Wintriss Controls Group

An overview of the different types of sensors available and how they actually work. Which sensors perform best in certain production environments and how they should be specifically applied to achieve the best results possible. Proximity, photo-electronic, strain, pressure, and linear sensors will be addressed.

Designing Sensors in the Tooling

Jeffrey Lawrence
Sensor Technician
GR Spring & Stamping Inc.

Learn how sensors are actually being used in a manufacturing company. Real examples will be provided which illustrate the successful design, development, and implementation of electronic sensors and controls. In-die dimensional measuring and closed-loop information flow will be addressed.

Pressroom Automation Using PLC Technology

John Eby
Sales Engineer—Control Systems
Toledo Transducers Inc.

Learn how PLC technology can assist you in achieving greater automation of the press. Many proprietary products are dependent on the original manufacturer for software modifications and customization. PLC technology on the other hand allows you the flexibility to upgrade your pressroom operations for automation.

Sensor Applications and Implementation

Jeff Wirtz, Sensor Specialist
Thomas Engineering Company

Practical sensor applications for producing small parts at high speeds (up to 1500 strokes per minute) will be presented. The case study will illustrate the use of sensors for die protection and to ensure part quality. Methods of using sensors to provide critical information for analyzing the stamping process will also be explored.



TRACK 4

ENVIRONMENT & SAFETY

Press-Brake Guarding

James Kirton, Vice President of Operations, ISB Services Inc.
Thomas J. Meighen, Safety & Risk Manager, Stromberg Sheet Metal Works Inc.

Learn about a press-brake-training program that enables employers to effectively address point-of-operation protection on power-press brakes. Gain an understanding of how the "safe-distance" standard is being applied in press-brake guarding using valuable procedures and proven training techniques.

Lockout/Tagout—What's the Problem?

Dennis Cloutier
Product Safety Coordinator
Cincinnati Inc.

Between October 1998 and September 1999, the industry paid more than \$412,000 to OSHA for violations pertaining to the control of hazardous energy regulation, commonly referred to as "lockout/tagout." This was the result of 749 citations from 415 inspections. What is it that makes this regulation so difficult to comply with?

Safeguarding-Control Systems

Thomas Pilz, CEO
Pilz Automation Safety LP

A look at control technology used to safeguard metalforming-production systems. Review the different types of safeguards and how they can be most effectively employed in various metalforming environments to meet U.S. and International safety standards. The advantages and limitations of various safeguards will be explored.

Machine-Safeguarding Technology

Roger Harrison, Director of Training
Rockford Systems Inc.

Learn how to recognize potential hazards and apply the latest methods to abate or correct them. Guards, interlocks, two-hand activators, light curtains, safe-distance calculation, pressure-sensitive mats, drop-probe devices, chuck shields, and chip-coolant splash are some of the various methods that will be reviewed.

Tuesday continued on next page

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TRACK 5

TRANSFER STAMPING

Future Press Shops for Automotive Stamping

Klaus Rothenhagen
Director Technical Applications
Muller Weingarten

Designing the press shop of the future has important competitive implications for your company in the world market. Various layouts and the associated costs of different press systems will be presented. Everything from blank production to production systems including camber, transfer and progressive presses, and support automation will be featured.

Advances in Tooling Technology

Dan Leighton
Sales Engineer
Atlas Technologies

Trace the evolution of transfer tooling! The various types of available effectors will be presented including types of fingers, pneumatic grippers, part sensors, actuators, and quick connectors. Learn how to coordinate processing and die design early in the design cycle to eliminate problems and identify engineering support.

Hydraulic-Press Systems

Andreas Kinzyk
Sales Manager
Schuler Inc.

The latest press technology used in hydraulic-transfer-press systems will be presented. How implementing a hydraulic-transfer-press system can help companies improve their production process through cost efficiencies and higher utilization. The overall advantages of this type of press system will be covered.

Transfer-Press Cell Solutions

Mike Austin
President and CEO
Atlas Technologies

The transfer-press cell is a proven concept that integrates automation for coil and blank handling with the programmable features of press transfer, centralized controls, scrap handling, die change, and even end-of-line part racking. Learn how these press features are preengineered to specifically meet required part size and productivity goals.



TRACK 6

SLIDE FORMING

Tooling a Part

John Dosek, Sr.
Management Consultant
Keats Manufacturing Co.

The process of tooling a part from its request for quotation stage through its approval for production will be covered. Key decisions regarding the method of tooling to be used and the choice of equipment to produce the parts on, along with coordinating the roles of the various departments involved with the project will be covered.

Types of Slide-Forming Machinery

Sherwood Griffing
Product Manager
U.S. Baird Corp.

The advantages and limitations of the various types of slide-forming machines will be covered. A variety of sample parts will be used to illustrate the capabilities of the various machines. A process for matching individual jobs to the most appropriate machine to maximize productivity and design flexibility will be outlined.

Value-Added Operations

Brian Robinson
Sales Manager
Bihler of America Inc.

Learn how to incorporate secondary operations—normally performed as separate and distinct operations off-line—within the slide-forming-machine process for greater efficiency and productivity. Welding, tapping, screw insertion and assembly operations will be covered. Understand how to expand the capabilities of the slide-forming machine.

Signature Analysis in Slide-Forming Machines

John Taylor
Vice President of Sales
Detroit Midwest Region
Signature Technologies Inc.

Learn how to take some of the guesswork out of slide-forming setup by exploring new and innovative ways to simply setup and build greater consistency into the process. Evaluate opportunities to drive setup time down using historical analysis rather than operator intervention. Measures to ensure the quality of your process and the part will be addressed.



TRACK 1

QUICK-DIE CHANGE

Die Clamping

Rod Blair
Vice President, Engineering
American Aerostar Corp.

Evaluate the various types of clamps used to secure dies to the bed of the press to prevent die deflection. Special emphasis will be placed on selecting the right clamp for the job, means of clamping, required clamping force, and the various sensors, interlocks, and hydraulic circuitry which may be used to ensure safe and efficient die clamping.

Integrating Pressroom Systems

Ron Demonet
Director of Sales
Atlas Technologies Inc.

New and proven concepts in automated-die-storage and retrieval systems will be reviewed. Methods for integrating pressroom systems will be introduced. Case studies illustrating the dramatic reduction that can be achieved in die-retrieval changeover and hit-to-hit times will be provided.

Quick Part-to-Part Changeover

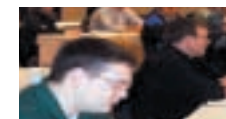
John Remington
Product Manager
The Minster Machine Co.

Learn techniques that enable your company to perform efficient part-to-part changeovers. Pinpoint bottlenecks that may be constraining the process. Learn how to reduce changeover of an entire progressive-die-stamping line. Gain specific advantages that will enable your operation to increase the total productivity of your pressline.

Safe Quick-Die Change

Dave Fischer, Engineering Manager
Hilma Division of Carr Lane
Roemheld

A quick-die-change system can help reduce inventories and achieve faster ways to move and clamp dies, while providing a safer work environment. Learn how dies can be moved safer and with less effort under highly controlled conditions as well as how hydraulic-clamping options can attain still higher levels of safety.



TRACK 2

ADVANCED ELECTRONICS

In-Die-Dimension Measurement

Jim Finnerty, Product Manager
Honeywell Wintriss Controls Group

Electronic in-die measurement is one of the most exciting technologies to come to the metal stamping industry. Effectively implementing an in-die measurement program will be covered. Selecting the appropriate sensors, wiring practices, sensor mounting, installation, and calibration will be addressed through real-life application examples.

In-Die-Displacement Measurement

Paul Chytka, Sales Manager
Kaman Instrumentation Operations

Learn how inductive-displacement systems can be used to perform in-die measurements that can be used to monitor and control the forming process. See how this system of measurement is implemented and how it can improve efficiency. Useful data on die alignment and out-of-tolerance shutdown also will be provided.

Electronic-Sensor Applications in Tooling

C. Steve Helton
Sensor Applications Specialist
Bachman Machine Co.

See how a company's sensor program has evolved from that of basic die and tooling protection to real-time measuring and qualifying of parts. Review the types of sensors to choose from, their application, and how to conduct close-loop evaluations using the data that has been gathered.

Signature Analysis to Improve Quality

John Taylor, Vice President of Sales
Detroit Midwest Region
Signature Technologies Inc.

Signature analysis can be used to monitor material variations, tool condition, lubrication, and machine condition. Learn how to convert existing components of your tooling into force sensors, and how the signatures from these sensors provide valuable information to improve your process.



TRACK 3

ENVIRONMENTAL & SAFETY

Metalworking Fluids—Occupation Exposures

Gary Hutter, President
Meridian One Engineering & Technology and Associate
Professor Illinois Institute of Technology

Metalworking fluids can become biologically fouled, can form mists in the workplace, contribute to airborne contamination levels, and can come in direct contact with workers. The potential hazards in an occupational setting, findings and limitations of evaluating exposure, and some of the key standards and guidelines will be covered.

Chemical Management

Kenneth S. Gunnufsen
Business Development Manager
Henkle Chemical Management

Chemical management is a proven business strategy that focuses on strengthening your company's core business, reducing total chemical cost, and improving environmental compliance. Learn how chemical management programs can provide purchasing support, on-site technical guidance and assistance in regulatory compliance.

Industrial-Air Cleaning

Mike Harris, Ph.D. CIH
Hamlin & Harris Inc.

Most modern production shops have some concerns with airborne contaminants such as welding smoke, grinding dust and coolant mist. Learn how government-approved methods are used to measure the concentration of these contaminants to determine whether you comply with OSHA regulations.



Wednesday continued on next page

Wednesday 8 am - Noon continued

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Selecting a Parts-Cleaning System

Edward Tulinski
Vice President/Sales & Marketing
JENFAB—Jensen Fabricating Engineers
Environmentally safe, user-friendly part-cleaning systems have become the method of choice for manufacturers striving to be environmentally compliant. An overview of parts-cleaning parameters will be presented including identifying the proper equipment, selecting the process, and configuring a system.



TRACK 4

MATERIAL HANDLING

New Magnetic Technology

Walter Shear
Vice President of Sales Operations
Industrial Magnetics Inc.
New developments in magnetic technology are resulting in dramatic productivity improvement for automated station-to-station, press-to-press transfer, robotic pick-and-place, and destacking applications. Case studies highlighting the benefits of this technology in terms of increased speed, greater flexibility, and cost reduction will be provided.

Robotic-Transfer Systems

Peter Stephan
Program Manager for Stamping
FANUC Robotics NA Inc.
Gain an understanding of how robotic technology can be used to transfer parts being produced on a single- or tandem-press line. Learn about the different types of robots and their application in the stamping and fabricating process, capabilities and functions, and requirements for integrating them into your facility.

Advances in Blanking and Multi-Blanking Technology

Dean Linders
Sales Manager
Red Bud Industries
Improving product quality while achieving higher levels of efficiency has become synonymous with success in the nineties. The expanded use of close-tolerance blanks in the production of fabricated components is playing an important role. Learn about cut-to-length and blanking lines that can efficiently produce parts consistently within a specific tolerance.

Justifying Capital Investment through Productivity

Rick Costello
President
Kent Corp.
Learn how to increase the productivity of your operations to the extent that you are able to generate enough cash to invest in other equipment to grow your business. The three most common cost justification measures will be reviewed: (1) payback period, (2) net present value and (3) IRR of return.



TRACK 5

METAL FABRICATING

Press-Brake Forming for the Future

Nick Fill, Product Specialist
Cincinnati Inc.
A whole new generation of press-brake technology is enabling manufacturers to reduce setup time and achieve greater throughput in an effort to meet the demand for just-in-time delivery. Learn how the CNC hydraulic-press brake can eliminate multiple operations, reduce part handling, and compliment your cellular production objectives.

Today's Waterjets

Chip Burnham
Vice President, Technology & Education
Flow International Corp.
The ultra-high-pressure waterjet is the fastest growing material-processing technology in the world today. Learn how these versatile and productive machine tools offer manufacturers unique capabilities. Case studies will illustrate how waterjets operate and the variety of finished parts that can typically be produced using them.



New Trends in Laser and Sheet-Metal Manufacturing

Johannes Ulrich
Manager, Laser Division
Finn-Power International
Learn how to produce various sheet metal components using laser cutting technology. Applying different machine concepts for punch-laser combination and ultra-fast, flying-optic laser-cutting machines will be covered. The use of laser technology will increase significantly in the future due to the customer's demand for more complex parts with greater accuracy at lower cost and faster turnaround time.

Secrets of Detroit in 3-D Laser Cutting

Keith Leuthold
Regional Sales Manager
Mazak Nissho Iwai Corp.
A brief overview of the history of 3-D laser cutting specifically highlighting uses in the automotive industry will be presented. Learn from automotive and non-automotive applications for flat-part and flat-blank development, and piercing and trimming applications in low volume 3-D applications.



TRACK 6

HYDROFORMING

An Overview of Hydroforming (2 Hours)

Taylan Altan
Professor and Director
ERC/NSM – The Ohio State University
Gain valuable insight into the practical application of the hydroforming process for producing complex metal parts. The overview will cover machine capabilities and controls, die design and development, material and lubrication considerations, as well as tooling considerations. New developments obtained through laboratory research will also be covered.

Explosive Hydro-Metal Forming

Kimberly I. May
Lead Engineer
Pacific Aeospace & Electronics
Explosive hydroforming is a unique process that uses a chemical charge to create enough pressure to displace water on the surface of the material. The material is subsequently formed within a die to produce the finished part. Learn how the hydroforming process can be harnessed to produce a myriad of shapes to very strict tolerances.

Development of a Hydroforming-Test System

Min Chen, Ph.D.
Project Leader
Industrial Research and Development Institute
Before a new tube or material can be used in hydroforming production, it must be evaluated for formability. The development of a free expansion hydroforming-test system to meet these test requirements will be described. Learn how results can be invaluable in the selection of equipment and identifying process limitations.



TRACK 1

QUICK-DIE CHANGE

ODC from A to Z: Getting Back to Basics (4 Hours)

Gary Zunker
President
Lightning Time Savers
Get the facts about implementing a successful quick-die-change (QDC) program. This practical approach will introduce you to getting organized for success, identifying techniques to reduce setups, and assessing the capital you'll need to support the program. Case studies will illustrate the dramatic improvements in changeover that can be achieved.



TRACK 2

PROGRESSIVE TOOLING

Processing Progressive-Stamping Dies (4 Hours)

Arnold Miedema
Consultant
Synergis Technology Group
Explore some of the most cost-effective methods to design and build progressive dies. Gain insight into every phase of the process from the initial layout to finished tool. Learn creative ways to design problems "out" of the stamping die instead of simply "fixing" them. Designing for minimum die maintenance also will be emphasized.

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Thursday 8 am - Noon continued

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TRACK 3

SHEET-STEEL FUNDAMENTALS

Low-Strength Steels (2 Hours)

Stu Keeler
President
Keeler Technologies

Learn how to match forming modes and steel properties, interpret what mechanical properties really mean, and decipher the multitude of steel types, grades, and trade names during this introductory short course on sheet metal. Learn how to apply the basic principles of metallurgy to improve part quality and operational performance.

High-Strength Steel (2 Hours)

Stu Keeler
President
Keeler Technologies

A perfect follow-up to low-strength steels, this course will address the application of high-strength steel including necessary adjustments to tooling as well as useful techniques for producing more dimensionally constant products. Learn sure-fire methods for ordering only the steel you really need and want.



TRACK 4

NEAR-ZERO-AUTOMOTIVE STAMPING

Dynamic Binder-Force Control

Tom Levitt
Manager, Safety Systems
Rockwell Automation

Learn what dynamic binder-force control is and how it can be used to improve the formability of deep-draw parts. The equipment involved and strategies to optimize draw quality based on changing binder force within the press cycle will be addressed. Test results evaluating the effect of various profiles on the finished part will be revealed.

Hemming Characteristics

William Faitel
Manager, R&D
Lamb Technicon

Hemming was a major focus of the Near-Zero-Stamping program. This presentation will describe the common hemming terms and key characteristics for accomplishing the hemming process. The various types of hemming, design guidelines for its use, and related issues on quality will be presented.

Die-Tryout & Formability Issues

Chris Burbick
Engineer
Sekely Industries

Learn how a die-tryout database is used to systematically capture tryout experience that can then be used to more efficiently plan future jobs. Actual test results obtained from plant floor evaluation will be shared. Also, learn how Finite Element Analysis (FEA) can be used to reduce time spent trying out the die.

Computer-Aided-Decision-Support System

Dr. Frank Plonka
Chair and Professor, Industrial & Manufacturing Engineering
Wayne State University

Learn about the development of a computer-aided-decision-support system and how it can enable manufacturers to make more educated product and process decisions. An engineering-database tool, the decision-support system is used to capture knowledge and make it readily available to others.



TRACK 5

Cosponsored by PMA and AWS

INTELLIGENT-RESISTANCE WELDING

Introduction to Intelligent-Resistance Welding

William Faitel
Manager, Research & Technology
Lamb Technicon

A Computer-Based Tool for Diagnosing Faults

Nigel Clay, Technical Specialist
Ford Motor Company, Advanced Manufacturing Technology Development Center

See how WeldSmart, a computer-based tool, can assist users to diagnose faults in RSW. It contains a matrix which relates 15 weld quality issues with 37 potential causes. The tool also contains a gallery of photographs of a variety of weld conditions and a list of factors, which can assist during trouble-shooting.

Weld Monitor and Control Strategies

Peter Rogers, Vice President
Business Development
Senotec Transducers & Instruments

Learn about new monitoring and control methods. New strategies to monitor the RSW process and to identify faults such as expulsion, poor fit-up, and small nugget size, based on analysis of sensor signals will be covered along with ways to better control the RSW process.

Spot-Weld Impact Tester

Dr. Hongyan Zhang, Ph.D.
Assistant Professor
University of Toledo

Learn about a new impact tester for spot welds and why it was needed, based on the relationship between weld characteristics, static strength, and impact strength. Impact strength is a very important factor for the crash behavior of automobiles. See how the machine works and typical test results.

Analysis of Resistance Spot-Welding Process Using FEA

Dr. Pingsha Dong, Ph.D.
Technical Director, Center for Welded Structures
Battelle

Learn how Finite Element Analysis has provided insights into the spot-welding process. The analysis helps develop an understanding of the relationships between the thermal, electrical, and mechanical characteristics of the RSW process.



TRACK 6

TRAINING & RESOURCES

Work Design & Workforce Development—A Systems Approach

Bruce Broman
PMAEF Program Director
Precision Metalforming Association

Enhance your understanding of the contribution that flexible, high-skilled forms of work reorganization can make to manufacturing performance. Identify the essential components of multiskilling concepts and their relationship to pay for skills. Various approaches for reorganizing your workforce for skill-based progressions will be explored.

Improving Equipment Performance Through TPM

Preston Ingalls
President
Marshall Institute Inc.

Total Productive Maintenance (TPM) is a rapidly growing process used to improve uptime, quality and cost in manufacturing. The benefits of a TPM process, five major goals, major elements of TPM, how autonomous maintenance helps to develop operator ownership, and why overall equipment effectiveness is critical for measuring TPM will be addressed.

10 Tips for Fast, Simple & Effective on the Job Training

Jeffrey J. Nelson
President
Expert OJT

On-the-job training (OJT) is a time-tested way for people to pass their expertise on to others. By making OJT systematic, you can decrease training time, increase skill retention, achieve consistent and predictable training and maximize the skills and knowledge in your organization. Look at: 1) capturing best methods with job aids 2) building a training baseline 3) measuring training progress and 4) key tips for fast development and delivery of training.

Making Hiring Decisions You Can Live With

Peter Chartier
President
CommTec Communications Group

The easy part in a hiring interview is assessing how "much" experience an individual has. The trick is to determine how "well" the applicant will perform. Lots of experience, no matter how relevant, in no way guarantees the applicant will perform well. Learn about an interviewing technique that allows you to accurately assess how "well" the applicant will perform.



THE **DRIVING FORCE** AT THE CORE
OF THE MANUFACTURING INDUSTRY

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Corrosion of Welds: Causes and Cures

Date: Sunday, May 6, 2001
Time: 8:30 a.m. – 4:30 p.m.
Instructor: Ted V. Weber

During this fast-paced one-day course, Ted V. Weber will cover what causes corrosion of metals and how to repair corroded welds. Weber uses highly relevant case histories to review the effects of alloying and heat treatment for corrosion resistance, with plenty of opportunity to ask questions and discuss the in-depth answers. The program is valuable for all professionals whose jobs entail repairing, identifying and fabricating pressure vessels and piping. Equipment inspectors, technicians, engineers, and management can benefit from this program.

Topics Covered:

- What causes the common forms of corrosion
- How to repair corroded welds
- How to avoid corrosion and minimize corrosion's effects on plant operations through alloying or heat treatment
- Case histories providing specific references to the causes and cures of welding corrosion.

Distributed Material:

The AWS Practical Reference Guide to Weld Corrosion: Causes and Cures

Inspection to the 2000: D1.1 Code

Date: Sunday, May 6, 2001
Time: 8:30 a.m. – 4:30 p.m.
Instructor: Ken W. Coryell

This one-day seminar is devoted to inspection of structural steel welds. Inspector qualifications and responsibilities of inspectors and contractors will be covered. Procedures and techniques for visual, liquid penetrant, magnetic particle, radiographic, and ultrasonic inspection are highlighted as a prelude to a detailed review of the inspection acceptance standards. Test method fundamentals will be covered, where necessary, to understand the more in-depth tables and criteria, along with tips on what to look for in inspection reports.

Whether you are a supervisor, engineer, inspector, or auditor, you will find this clear presentation a must for better understanding of weld quality.

Topics covered:

- General Requirement, Including:
- Basis of inspector qualifications
- Inspection of materials
- Inspection of WPSs and equipment
- Inspection of qualifications
- Inspection of work and records

Acceptance Criteria, Including:

- Visual
- Liquid penetrant and magnetic particle
- Radiographic
- Ultrasonic criteria for all design loading conditions

NDE Procedures, Including:

- Personnel qualification
 - Radiographic testing
 - Ultrasonic testing
 - Magnetic particle testing
 - Liquid penetrant testing
- *Bring your copy of the AWS D1.1:2000 Structural Welding Code Steel.
- *Current Certified Welding Inspectors will accrue seven direct hours toward their 9-year recertification requirement.

What Professionals Need to Know about Metallurgy

Date: Monday, May 7, 2001
Time: 8:30 a.m. – 4:30 p.m.
Instructor: Ted V. Weber

You will avoid a lot of welding problems if you have a basic understanding of welding metallurgy. So whether you are an engineer without formal welding training, or an ambitious senior welder or technician, this is need-to-know information.

Topics Covered:

- Metallurgical aspects of welding
 - Alloying elements and their effects on welding
 - Effects of welding variables
 - Heat treatment considerations
 - Steel alloys phases and properties
 - Diffusion and solid solubility of metals
 - Review of metal forms (cast, wrought and forged)
 - Metal solidification, grain size, and residual stress
- ### You Can Learn:
- How to avoid welding problems and what to do when they occur
 - How to judge differences in the properties of metals (structures and alloying)
 - How to identify hardenability and cooling rate aspects versus welding difficulties
 - Metallurgical considerations in the welding of stainless steels, aluminum, copper, nickel, refractory metals, and more

Distributed Material:

- *AWS Practical Reference Guide to Welding Metallurgy: Key Concepts of Weldability*

*Current Certified Welding Inspectors will accrue seven direct hours toward their 9-year recertification requirement.



Arc Welding and Power Sources

Date: Monday, May 7, 2001
Time: 8:30 a.m. – 4:30 p.m.
Instructor: Edward R. Bohnart

Veteran Ed Bohnart has poured 30 years of hands-on experience into a much needed, and demanded program from AWS. This isn't an advance course inflated with theory. It's a primer directed at engineering professionals with evolving responsibilities in welding, or for the ambitious senior technician.

If extracting the most from power sources has been a constant problem, if you need to know the ins and outs of set-up and smooth operation, or if this facet of welding is a new job responsibility, then do not miss this opportunity. The program will benefit professionals who specify arc weld equipment and processes, such as engineers, technician, welders, supervisors, and set-up and maintenance personnel. Purchasers will particularly benefit.

Topics Include:

- Equipment operating precautions
- Equipment and process fundamentals: GTAW, SMAW, GMAW, FCAW, and CAC
- Voltage, amperage and metering
- Power sources
- Controls
- Problems and troubleshooting
- Common misunderstandings

You Can Learn:

- How to get more performance from your existing equipment
- Why your electric power bill is the most commonly overlooked expense
- How to use product specifications to select the power source with the right features

Distributed Material:

- The Professional's Advisor on Arc Welding Power Sources
- Recommended Practices for Tungsten Arc Welding
- Recommended Practices for Gas Metal Arc Welding

*Current Certified Welding Inspectors will accrue four direct hours toward their 9-year recertification requirement.



Road Map Through the D1.1 Code

Date: Tuesday, May 8, 2001
Time: 8:30 a.m. – 4:30 p.m.
Instructor: Ken W. Coryell

This one-day program will provide a comprehensive overview of the AWS D1.1: 2000 Structural Welding Code-Steel. Each of the Code sections, including General Requirements, Design of Welded Connections, Prequalification, Qualification, Fabrication, Inspection, Stud Welding, and Strengthening and Repair of Existing Structures, will be summarized, with emphasis on their interrelationships and usage. Additionally, the role of mandatory and non-mandatory annexes will be reviewed, along with tips for how to use the Code Commentary.

Who Should Attend:

This program will benefit managers, engineers, supervisors, inspectors and other decision makers who need a good overall comprehensive understanding of what is and what is not covered by D1.1 in order to improve their job effectiveness.

*Bring your copy of the AWS D1.1:2000 Structural Welding Code Steel.

*Current Certified Welding Inspectors will accrue seven direct hours toward their 9-year recertification requirement.

Design & Planning for Cost-Effective Welding

Date: Wed., May 9, 2001
Time: 8:30 a.m. – 4:30 p.m.
Instructor: Eugene G. Hornberger

This course, presented by Eugene Hornberger, covers all the aspects of accepting the job, making progress on the job, solving problems and completing the welding projects on time. It will provide the background needed by engineers, supervisors and senior technicians who carry welding management responsibilities.

Get a mumbo-jumbo free explanation of the how and why of common pitfalls that make some welding projects difficult, or even seem impossible, to run smoothly. Find out how to avoid these negative conditions in the first place, or at very least, how to take the right corrective actions.

Who Should Attend:

You should attend if you have questions like these about your fabricating project and its weldability:

- Does the fabrication perform the intended service, and will it last as long as intended?
- Is the welded fabrication on time and within budget?
- Are there any inspections or requirements associated with the weld that will prevent acceptance?
- Is there adequate weld joint access?
- Are the fabrication requirements achievable from the standpoint of accessibility, position, distortion control, weld size, inspection requirements, and fabrication sequence?

Topics covered:

- Production welding cost analysis
- Welding process selection
- Fatigue consideration
- Weld joint design factors
- Defects and discontinuities
- Practical aspects of welding metallurgy
- Thermal spray fundamentals
- Welding safety

Distributed Material:

- Design and Planning Manual for Cost-Effective Welding

*Current Certified Welding Inspectors will accrue seven direct hours toward their 9-year recertification requirement.

- Welding of Stainless Steels – Parts 1 and 2

Basics to Avoiding Weld Defects

Dates: Wed. and
Thurs., May 9-10, 2001
Time: 8:30 a.m. – 4:30 p.m.
Instructor: Richard Campbell

This seminar has two independent parts: Part 1 - The Basics (Wednesday, May 9) and Part 2 - Avoiding Defects (Thursday, May 10). You may register for either day alone or for both days. (See Registration form)



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Welding of Stainless Steels Part 1—The Basics

Date: Wednesday, May 9, 2001
Time: 8:30 a.m. – 4:30 p.m.
Instructor: Richard Campbell

This course is designed for engineers and technicians who work with stainless steels and could benefit from a greater understanding of the special considerations necessary to weld these alloys.

The program focuses on the basic weldability of all types of stainless steels. If you need a comprehensive look at the weldability of stainless steels, particularly the 300 series, this course is for you.

Topics Covered:

- Why alloys are "stainless"
- Stainless steel differences
- Selecting a stainless for use
- Mechanical properties
- Properties after welding
- Heat treatment factors
- Selecting filler metals
- Gas vs. flux shielding
- Code requirements

You Can Learn:

- Five stainless steel types
- The effects of welding on all types of stainless steels
- Why some stainless steels require preheat and others prohibit it
- Answers to your questions about selecting and welding stainless steels

Distributed Material:

- The Professional's Advisor on Welding Stainless Steels
- The AWS Structural Welding Code-Stainless Steel (D1.6-98)

*Current Certified Welding Inspectors will accrue seven direct hours toward their 9-year recertification requirement.

Stainless Steels: Part 2—Avoiding Defects

Date: Thursday, May 10, 2001
Time: 8:30 a.m. – 4:30 p.m.
Instructor: Richard Campbell

This program is designed for those individuals possessing a basic understanding of stainless steels. It focuses on defects, special problems and typical applications associated with welding all types of stainless steels.

Topics Covered:

- Specific weld defects
- Sensitization
- Penetration problems
- Weld hot cracking
- Weld cold cracking
- Excessive grain growth and other embrittlement concerns
- Welding dissimilar metals

You Can Learn:

- The most encountered welding problems for each of the five stainless steel types
- Methods to reduce or eliminate hot cracks and sensitization
- Answers to your questions about the application of different stainless steels to avoid weld defects.

Distributed Material:

- The Professional's Advisor on Welding Stainless Steels
- The AWS Structural Welding Code-Stainless Steel (D1.6-98)

*Current Certified Welding Inspectors will accrue seven direct hours toward their 9-year recertification requirement.

Why and How of Welding Procedure Specifications

Date: Thursday, May 10, 2001
Time: 8:30 a.m. – 4:30 p.m.
Instructor: Ken W. Coryell

If you are responsible for planning a welding operation here is a question: Which of the following items is the most critical, base metal weld process, filler metal, current and range, voltage and travel speed, joint design tolerances, joint and surface preparation, tack welding, weld position, preheat and interpass temperature, or shielding gas? This course provides the answers.

The instructor, Ken Coryell, uses his 25 years of international and domestic experience in welding quality to shed light on the most common problems, misunderstandings, and mistakes. Coryell offers insider advice, hints, and tips on optimum use of the Procedure Qualification Record (PQR), and the Welding Procedure Specification (WPS).

This program will benefit owners, managers, engineers and supervisors who must qualify, write, or revise their own welding procedure specifications to satisfy codes and contract documents.

Topics Covered:

- Proper preparation and qualification of welding procedure specifications
- Selecting and documenting welding variables
- Documenting of standard procedure qualification testing for commonly used processes for joining ferrous plate and pipe materials

You Can Learn:

- How to specify essential and nonessential variables commonly used in sample: AWS, ASME and API code formats.
- How to use standards when preparing procedures
- How to document welding variables and qualification tests
- How to avoid the pitfalls in revising previously qualified procedures

Distributed Material:

- AWS B2.1-98 Specification for Welding Procedure and Performance Qualification

*Current Certified Welding Inspectors will accrue seven direct hours toward their 9-year recertification requirement.



PROFESSIONAL PROGRAM



MONDAY, MAY 7, 2001

Morning Sessions 9:00 am

Session 1: Laser Welding 1

- Dual Beam Nd:YAG Laser Welding of 5182 Aluminum Sheet, by M. G. Deutsch, A. E. Punkari, H. W. Kerr, and D. C. Weckman, University of Waterloo.
- Laser Beam Welding of Copper Solar Collectors, by P. W. Fuerschbach, A. R. Mahoney, and F. M. Hooper, Sandia National Laboratories.
- Laser Blank Welding Automotive High Strength Steels, by H. Shao, and J. Gould, EWI; and C. Albright, The Ohio State University.
- Non-Linear Dynamics Laser Weld Quality Monitoring, by M. Cho, and D. F. Farson, the Ohio State University.
- Laser Roll Bonding of Aluminum Alloy and Carbon Steel, by M. J. Rathod, and M. Kutsuna, Nagoya University, Japan.

Session 2: Stainless Steel 1

- Nitrogen Absorption by Iron and Stainless Steels during Laser Welding, by W. Dong, H. Kokawa, Y. S. Sato, S. Tsukamoto, Tohoku University, Japan.
- Carbon Pickup From Argon-CO₂ Blends in Stainless GMAW, by D. J. Kotecki, The Lincoln Electric Co.
- Dissolution Kinetics of NbC Particles in HAZ of Type 347 Stainless Steel, by L. Li, University of Northern Iowa; and R. W. Messler, Rensselaer Polytechnic Institute.
- Development of a Test Technique for Evaluating Ductility Dip Cracking Susceptibility in Austenitic Alloys, by N. Nissley and J. C. Lippold, The Ohio State University.
- Solidification and Weldability of Super Austenitic Stainless Steels, by S. W. Banovic, J. N. DuPont, M. J. Perricone and A. R. Marder, Lehigh University.

Session SP1: Modern Process Characterization & Control Methods

Sponsored by the U.S. Department of Energy (DOE)
Interagency Manufacturing Operations Group (IMOG).

- Weld Shapes in Hyperbaric GTAW of Stainless Steel, by P. Burgardt, Los Alamos National Laboratory.
- Process Characterization and Development of a Percussive Arc Weld, by G. A. Knorovsky and D. O. MacCallum, Sandia National Laboratories.
- Laser Welding of Quartz, by M. Piltch, R. Carpenter and M. Archer, Los Alamos National Laboratory.

Afternoon Sessions: 2:00 pm

Session 3: Resistance Welding

- Microstructural Development During Resistance Spot Welding Interstitial-Free Coated Sheet Steels, by J. E. Gould and D. Workman, Edison Welding Institute.
- Effect of Ni/Au Plating on Micro-Resistance Spot Welding of Thin Sheet Nickel, by W. Tan, Y. Zhou and H. W. Kerr, University of Waterloo, Canada.
- Dynamic Failure Load Measurement of Spot Weld and Rivet, by X. Sun, Battelle Memorial Institute; and M. Riesner and E. Low, Ford Motor Company.
- Effects of Electrode Face Topology on Nugget Development During Resistance Spot Welding, by F. Lu and P. Dong, Battelle Memorial Institute.
- Metallurgical Interpretation of Electrode Life Behavior in Resistance Spot Welding of Aluminum Sheet, by W. Chuko, and J. Gould, Edison Welding Institute.

Session IT1: Process Optimization

- Effects of Fabrication History on High Temperature Damage Development, by F. W. Brust, Battelle Memorial Institute.
- Optimization of Arc Welding Procedures for Aerospace Applications, by I. D. Harris, Edison Welding Institute.
- Application of Flash Welding to Joints of Steel Structure, by A. Umekuni, Takenaka R & D Institute, Japan; and B. Kato, Welding Institute, Japan.
- Computer Programs for the Welding Engineer, by O. W. Blodgett, The Lincoln Electric Co.

TUESDAY, MAY 8, 2001

Morning Sessions: 9:00 am

Session 4: Arc Welding Processes

- Seam Tracking Using Non-Transferred Plasma Arc, by S. B. Zhang, J. Philips, Y. M. Zhang, University of Kentucky.
- Graphical Characterization of Pulse GMAW Parameter Performance, by A. Joseph and D. D. Harwig, Edison Welding Institute; and R. Richardson, the Ohio State University.
- Twin Wire GMAW-P on Thin Gage 409 Stainless Steel, by S. P. Moran, Miller Electric Manufacturing Co.; and J. Kotnik, Arvin Meritor.
- No Lights, No Cameras, No Contact: Fringing Field Seam Tracking, by J. L. Novak, SenSolve, Inc.

Session 5: Modeling & Distortion

- Transient Thermal Tensioning for Control of Buckling Distortion, by R. M. Dull, J. R. Dydo, and J. J. Russell, Edison Welding Institute.
- FE Analysis/M Measurement of Residual Stresses in a Multi-Pass Repair Weld with Temper-Bead Techniques, by J. Zhang, P. Dong and J. K. Hong, Battelle Memorial Institute.
- Analysis and Proof of Hot Strain Behavior During Welding, by T. Saito, M. Shiwa, M. Yamada, S. Nakahigashi, K. Nakata and M. Oishi, Japan Power Engineering and Inspection Corp.
- Distortion Analysis and Control in Welding Assembly of Thin Wall Tubular Frames, by C. L. Tsai, X. Cheng, G. Jung and Y. Zhao, the Ohio State University.
- Proof-Loading Effects on Weld Residual Stress Redistributions in Seam-Welded High Strength Steel Line Pipes, by J. K. Hong and P. Dong, Battelle Memorial Institute.

Tuesday continued on next page



PROFESSIONAL PROGRAM

Tuesday continued

Session 6: Stainless Steel 2

- A. Ferrite Number Prediction that Includes Cooling Rate as a Variable, by J. M. Vitek and S. A. David, Oak Ridge National Laboratory.
- B. Development of a Primary Solidification Mode Diagram for Pulsed Laser Welding of Austenitic Stainless Steel, by T. J. Lienert, Edison Welding Institute
- C. In-Situ Observations of Phase Transformations in Duplex Stainless Steel Weldments Using Synchrotron Radiation, by T. A. Palmer, J. W. Elmer, J. Wong, Lawrence Livermore National Laboratory.
- D. Solidification Behavior of Fusion Welds in Gadolinium Enriched Stainless Steels for Storage of Spent Nuclear Fuel, by J. N. DuPont, D. B. Williams, Z. Q. Liu, Sandia National Laboratories; C. V. Robino, Sandia National Laboratories.
- E. Effect of Enhanced Buoyancy Convection on the Weld Microstructure, by D. K. Aidun and C. Liu, Clarkson University.

Afternoon Sessions: 2:00 pm

Session BS1: Applied Brazing Developments

- A. Precision Laser Brazing Utilizing Non-Imaging Optical Concentration, by V. Davé, R. W. Carpenter II, & J. O. Milewski, Los Alamos National Laboratory; and D. T. Christensen, Rice University.
- B. Innovative Gap Filling Techniques in Hydrogen-Nitrogen Atmosphere Brazing, by K. S. Allen, Turbo Braze Corp.
- C. Application of Brazing in Fabrication of Heat Transfer Elements, by C. Dattamajumdar, HI TecMetal Group, Inc.
- D. Brazing of Steel Stack Plate Assemblies, by A. J. Schaffeld, HiTech Aero Division.
- E. Strength of Aluminum Braze Joints and Other Phenomenon, by C. E. Wesolek, Modern Metal Proc., Inc.
- F. Use of Concentrators to Aim the Induction Heating Magnetic Energy, by T. J. Learman, Alpha-I.

Session 7: Laser Welding 2

- A. Optimization of Laser DMD Process Parameters, by M. Rahimi and D. Farson, the Ohio State University.
- B. A Generalized Model for Weld Pool Shape and Size, by A. Robert and T. DebRoy, the Pennsylvania State University.
- C. Impacts of Canceling Shielding Gas in Nd:YAG Laser Welding, by J. Xie, St. Jude Medical CRMD; and X. Chen, Visteon.
- D. CO₂ Laser Plume Interaction, by K. R. Kim and D. F. Farson, the Ohio State University.

Session 8: Weldability Testing/ Weld Cracking

- A. Correlation Between Grain Boundary Character and Grain Boundary Liquation in the Weld Heat-Affected Zone, by T. W. Nelson and R. J. Steel, Brigham Young University; and W. Lin, Pratt & Whitney.
- B. Development of a Gleeble Based Test for Postweld Heat Treatment Cracking Susceptibility, by S. Norton and J. C. Lippold, the Ohio State University.
- C. The Effect of Multiple Postweld Heat Treatment Cycles on the Weldability of Wasaploy, by M. Qian and J. C. Lippold, the Ohio State University
- D. Investigation of Stress-Relief Cracking Susceptibility in a Modified Cr-Mo Steel Using High Resolution TEM Techniques, by J. G. Nawrocki, J. N. DuPont and A. R. Marder, Lehigh University; and C. V. Robino, Sandia National Laboratories.

Session SP2: Modeling of Welding Processes & Quality Assurance

Sponsored by the U.S. Department of Energy (DOE) Interagency Manufacturing Operations Group (IMOG).

- A. The Practical Analysis of Welding Processes Using Finite Element Analysis, by J. H. Cowles, Ingenium Technologies Group, Inc., V. R. Dave and D. A. Hartman, Los Alamos National Laboratory.
- B. A Probabilistic, Semi-Empirical Approach to Modeling Diffusion Bond Strength, by V. R. Dave and D. A. Hartman, Los Alamos National Laboratory; and J. Barbieri, Pratt & Whitney.
- C. Eliminating Post-Process Inspection of Inertia Friction Welds through In-Process, Quality-Based Monitoring, by D. Hartman, V. R. Dave and M. J. Cola, Los Alamos National Laboratory.
- D. Reduced Order Heat Generation Model for Inertia Welded Dissimilar Tubes, by V. R. Dave and M. J. Cola, Los Alamos National Laboratory; and G. N. A. Hussien, Stanford University.

WEDNESDAY, MAY 9, 2001

Morning Sessions: 9:00 am

Session 9: Aluminum Metallurgy

- A. The Use of Analytical Electron Microscopy to Evaluate Fusion Boundary Microstructure Evolution in Zr- and Sc-Bearing Al-Alloys, by A. Kostrivas, J. C. Lippold, and M. J. Mills, the Ohio State University.
- B. Improving Columnar to Equiaxed Transition During Solidification of Welds, by C. Pan, A. T. Male, Y. Zhang, University of Kentucky.
- C. Partially Melted Zone in Aluminum Welds - Solute Segregation and Mechanical Behavior, by S. Kou, and C. Huang, University of Waterloo, Canada.
- D. Grain Boundary Liquation in Aluminum Welds - Planar and Cellular Solidification of Liquefied Material, by S. Kou, and C. Huang, University of Waterloo.
- E. Joining High-Strength Aluminum to Depleted Uranium Using an Explosively Clad Niobium Interlayer, by J. W. Elmer and P. Terril, Lawrence Livermore National Laboratory; and D. Butler and D. Brasher, High Energy Metals, Inc.

Session 10: Hydrogen in Welds

- A. Effect of Electrode Overcoating on the Enhancement of Underwater Wet Weld Quality, by J. Major and S. Liu, Colorado School of Mines.
- B. An Evaluation of the Relative Hydrogen Cracking Risk of FCAW-S, by C. Dallam, B. Kahn, M. Quintana, The Lincoln Electric Co.; and V. van der Mee, Lincoln Electric Europe.
- C. Hydrogen Control in Steel Weld Metal by Means of Fluoride Additions in Welding Flux, by M. Matsushita and S. Liu, Colorado School of Mines.
- D. Single-Pass Arc Welding of Heavy Section Materials, by Y. Zhang, S. Zhang and M. Jiang, University of Kentucky.

Session SP3: Microstructure & Properties of Some Unique Weldments

- A. Grain Boundary Character Distribution in OFE Copper and its Influence on Weldability, by M. J. Cola, V. R. Dave, P. W. Hochanadel and F. M. Smith, Los Alamos National Laboratory; and M. Kumar, Lawrence Livermore National Laboratory.
- B. Inertia Friction Welding Ti 6Al-4V to Alloy 625, by M. J. Cola, V. R. Dave, D. F. Teter, and A. M. Kelly, Los Alamos National Laboratory.
- C. Structure/Property Relationships in Multipass GMA Welding of Beryllium, by P. W. Hochanadel, M. J. Cola, D. F. Teter, W. L. Hults, P. Burgardt, D. J. Thoma, P. Papin, V. R. Dave, Los Alamos National Laboratory.
- D. Fabrication of Metal Matrix Composites via Laser Engineered Net Shaping, by J. D. Puskar, S. V. Prasad, C. V. Robino, M. S. Oliver and J. A. Brooks, Sandia National Laboratories.
- E. Fabrication of Hiperco Alloy 50/304L Stainless Steel Structures, by C. V. Robino, J. D. Puskar, M. S. Oliver, J. A. Brooks and C. W. Vanecek, Sandia National Laboratories.

Afternoon Sessions: 2:00 pm

BS2: Brazing Research and Applications

- A. Braze Wettability - A Study of Nickel Alloy Substrates, by D. Brown and H. Lichtenberger, Williams Advanced Materials; and R. Beckwith, CPI.
- B. Ti Scavenging in Active Braze Joints Between FeNiCo and Alumina, by P. Vianco, J. J. Stephens, P. F. Hlava and C. A. Walker, Sandia National Laboratories.

- C. Joining of Alumina Using Au-Ni-Ti Filler Metal, by C. H. Cadden, F. M. Hosking; and N. Y. C. Yang, Sandia National Laboratories.
- D. Investigation into the Joint of Alumina-Steel Brazed by PTLP, by J. X. Zhang, R. S. Chandel, H. P. Seow and G. G. Zhang, Nanyang Technological University, Singapore.
- E. Titanium Alloy Brazing Technology Review, by F. M. Hosking, Sandia National Laboratories; and T. Oyama, WESGO Metals.
- F. Cost-Effective Ti-Zr-Ni-Cu Powder Alloys for Vacuum Brazing of Titanium at 1610-1650° F, by A. E. Shapiro, IVAC Technologies Corporation.
- G. Lithium-Free Non-Toxic Flux Systems for Titanium Brazing in Air, by A. E. Shapiro, IVAC Technologies Corporation.

Session 11: Friction Welding & Solid State Processes

- A. Micro-texture Analysis in Friction-Stir-Weld of 6063 Aluminum, by Y. S. Sato, H. Kokawa, K. Ikeda, M. Enomoto, S. Jogan and T. Hashimoto, Tohoku University, Japan.
- B. Determination of Load, Torque and Temperature During Friction Stir Welding of Aluminum Alloys, by T. J. Lienert and W. L. Stellweg, Edison Welding Institute.
- C. From Plastic Slip Zone to Stir Flow Zone, by P. Dong, Z. Cao, F. Lu and J. K. Hong, Battelle Memorial Institute.

Session IT2: Hydrogen Cracking

- A. Evaluation of Necessary Delay Before Inspection of Hydrogen Cracks, by R. Pargeter, The Welding Institute.
- B. Diffusible Hydrogen Dependence on SMAW Electrode Storage Conditions, by B. Patchett and S. Hoskins, University of Alberta.
- C. Hydrogen Cracking Control Method for Welding Thick Steels in Shipbuilding, by J. H. Devletian, Portland State University; and N. D. Fichtelberg, Electric Boat Corporation.
- D. Metallurgical-Mechanical Study of the Failure Modes in Coke Drums, by J. A. Penso and C. L. Tsai, the Ohio State University.

Thursday, May 10, 2001

Morning Sessions: 9:00 am

Session 12: Non-Ferrous & Intermetallic Alloys

- A. Pore Formation during Laser Welding of Magnesium and Aluminum Alloys-Mechanisms and Remedies, by H. Zhao, and T. DebRoy, The Pennsylvania State University.
- B. Effect of Magnesium Content on Nd:YAG Laser Welding of Aluminum-Magnesium Alloys, by A. E. Punkari, M. G. Deutsch, H. W. Kerr, D. C. Weckman, University of Waterloo.
- C. Flux-Assisted GTA Welding of Magnesium Alloys, by M. Marya, and G. R. Edwards, Colorado School of Mines.
- D. The Use of Active Fluxes During Welding of Gamma TiAl Alloys, by J. S. Breeding, and J. C. Lippold, the Ohio State University; and W. A. Baeslack, Rensselaer Polytechnic Institute.
- E. Fusion Welding of Ni-Mo Alloys, by B. D. Newbury, and J. N. DuPont, Lehigh University; and C. V. Robino, Sandia National Laboratories.

Session 13: HSLA Steels

- A. TRXRD Observations of Microstructural Evolution in Self-Shielded Flux Cored Arc Weld Deposits, by S. S. Babu, and S. A. David, Oak Ridge National Laboratory; J. W. Elmer, Lawrence Livermore National Laboratory; and M. Quintana, The Lincoln Electric Company.
- B. Microstructural Characterization of Low Alloy Steel Welds Containing Yttrium, by M. D. Clark and G. R. Edwards, Colorado School of Mines.
- C. The Effect of Mo On High Strength Ferritic SMAW Deposit, by E. S. Surian, Air Liquide, Argentina; N. M. Ramini de Rissone, Universidad Tecnologica Nacional, Argentina; and L. A. de Vedia, Universidad Nacional de San Martin, Argentina.
- D. Modeling Simultaneous Formation and Growth of Inclusions in Low Alloy Steel Welds, by T. Hong and T. DebRoy, the Pennsylvania State University.

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MONDAY, MAY 7, 2001

Afternoon Sessions: 2:00 pm

Installing, Maintaining and Verifying Your Charpy Impact Machine

Instructor: D.P. Vigliotti, National Institute of Standards and Technology

The low cost and simple configuration of the Charpy impact test have made it a common requirement in codes and standards for critical structures such as pressure vessels and bridges. Because the quality of the data developed by pendulum impact machines depends on how well the machines are installed and maintained, ASTM Standard E 23 Standard Test Methods for Notched Bar Impact Testing of Metallic Materials specifies annual verification tests. This workshop explains the common problems that cause machines to fail the annual verification test, and offers potential solutions. Each year, NIST provides reference specimens for indirect verification of over 1,000 machines around the world. From evaluation of the absorbed energies and the fractured specimens, we attempt to deduce the origin of energies that are outside the ranges permitted by Standard E 23, and report these observations back to the machine owners. In this workshop, we will discuss the bases for these observations, and hopefully allow machines to be maintained at higher levels of accuracy. In addition, we provide details of the NIST verification program procedures and the production of the specimens.

What You Need to Know About Safety & Health Issues in the Welding Environment

Chair: Kevin Lyttle, Praxair

CoChair: Sue Fiore, Edison Welding Institute

- Proposed guidelines for manganese and chromium exposure that can affect allwelding operations—update on OSHA activity in the welding area, by K. Brown, Lincoln Electric
- How to select the fume removal system that is best for your workspace introduction to the new AWS ventilation document (F3.2-xx), by T. Pumphrey, Lincoln Electric
- What type of welding curtain is best for your application? Draft AWS standard on welding curtains, by B. Tucker, Dalloz
- Are you still worried about these issues: contact lenses, pacemakers, and electromagnetic fields (emf) and more—in the welding environment? See Safety and Health Fact Sheets—your “quick” guide to safety, by R. Jennings, Miller/ITW.
- Fire safety in metal fabrication—new NFPA video, by G. Manz.

TUESDAY, MAY 8, 2001

Afternoon Sessions: 2:00 pm

Advanced Commercial Technology-1 Sheet Metal Welding

Session Chair: Sue Fiore, EWI

The challenges for high-speed high integrity welding of sheet metal; steels, coated steels, aluminum and other materials will be described, and available methods and equipment that address these needs will be presented.

- 2:00 PM Keynote: Overview of Automotive Applications for Sheet Welding, by M. Karagoulis, General Motors
- 2:35 PM New Technologies in Sheet Metal Joining, by M. Kimchi.
- 3:10 PM Multiple Wire GMAW Welding, by S. Moran, Miller Electric.
- 3:45 PM Welding of Coated Steels, by P. Howe, Bethlehem Steel.
- 4:20 PM Welding of High Strength Sheet Steels, by J. Gould, Edison Welding Institute.

Advanced Commercial Technology-2 Friction Stir Welding

Session Chair: David Meyer, ESAB Welding and Cutting Systems

The challenges for high-speed high integrity welding of sheet metal; steels, coated steels, aluminum and other materials will be described, and available methods and equipment that address these needs will be presented.

- 2:00 PM Keynote, by D. Nicholas, The Welding Institute.
- 2:35 PM Applications and Equipment for FSW, by L. Holt, ESAB
- 3:10 PM Taking the Friction Stir Process to Titanium, etc., and even steel, by T. Lienert, Edison Welding Institute.
- 3:45 PM An Industrial Application of FSW, by D. Waldron, Boeing.



WEDNESDAY, MAY 9, 2001

Afternoon Sessions: 2:00 pm

Advanced Commercial Technology-3 Laser Technology

Session Chair: Fritz Saenger, Edison Welding Institute

Lasers have taken over many of the sheet metal welding applications in high production applications. Where is this technology headed, and what are the implications for your company?

- 2:00 PM Keynote, by Dr. A. Matsunawa, Joining and Welding Research Institute
- 2:35 PM Welding thick sections with Lasers, by Dr. T. Jutla, Caterpillar, Inc.
- 3:10 PM Diode Lasers, by T. Nacey, Panasonic; and J. Haake, Nuvonyx.
- 3:45 PM Dual Beam Lasers, by Dr. J. Xie, Edison Welding Institute.
- 4:20 PM YAG Lasers, by T. Kugler

Advanced Commercial Technology-4 Process Optimization

Session Chair: Howard Ludewig, Caterpillar, Inc.

Automated welding applications require relatively high levels of investment, but it is not clear that most companies are achieving the best quality and productivity that these systems can deliver. This session will bring you up to date on the challenges that face manufacturers, and various types of optimization technology, using both experimental and statistical methods will be described.

- 2:00 PM Keynote: Welding Process Optimization, by R. Richardson, the Ohio State University
- 2:35 PM Arc Welding Procedure Optimization, by D. Harwig, Edison Welding Institute.
- 3:10 PM Process Simulation, by F. W. Brust, Battelle Memorial Institute.
- 3:45 PM Manufacturing System Simulation, by B. Brown, Delmia.
- 4:20 PM Automated Weld Inspection, by Servo Robot.

AWS EVENTS

SUNDAY, MAY 6, 2001

American Welding Society Opening Session And Business Meeting

9:00 a.m. - 11:00 a.m.—I-X Center
Free to all registrants.

Comfort A. Adams Lecture

11:00 a.m. - noon—I-X Center
The 2001 Comfort A. Adams Lecture will be presented by Dr. Glyn M. Evans. The topic will be “Structure and Properties of Ferritic Steel Arc Welds.”

AWS Officers/Presidents/Counterparts Reception

6:00 p.m. - 8:00 p.m.
Renaissance Cleveland Hotel

MONDAY, MAY 7, 2001

AWS Prayer Breakfast

7:30 a.m. - 8:30 a.m.—I-X Center
Tickets: \$20.00

74th AWS Awards Ceremony and Luncheon

Noon - 2:00 p.m.—I-X Center
Tickets: \$30.00.

TUESDAY, MAY 8, 2001

Plummer Lecture A “Genetic Analysis” of High Performance Welding Education Programs

9:00 a.m. - 10:00 a.m.—I-X Center
Dennis Klingman, Director of Technical Training, The Lincoln Electric Company, will present this year’s lecture.

Watch America’s Best at the U.S. Open Weld Trials

A highlight at MAX International will be the U.S. Open Weld Trials, cosponsored by the American Welding Society and Skills USA-VICA. This competition supports education and the future of the industry by encouraging students to test their skills in welding, math, engineering, science, and physics before a panel of judges. The winner receives a \$40,000 scholarship and will represent the U.S. in World Skills competition in Korea.

EDUCATOR PROGRAM

Sponsored by AWS Education Committee

TUESDAY, MAY 8, 2001

Morning Session: 10:00 am

Session E1: Welding Titanium

Chair: A. J. Badeaux, Crossland Technical Academy

- Basic Titanium Welding by John Mansees, Hi-Tech Welding
- Application of Titanium by Wyatt Swaim, Hi-Tech Welding
- Mechanized Welding of Titanium Alloys, by Richard Arn, Teletherm Technologies, Inc.
- S.E.N.S.E. Program Update by A. J. Badeaux, Crossland Technical Academy

Afternoon Session: 2:00 pm

Session E2: Welding Education

Chair: A. J. Badeaux, Crossland Technical Academy

- The Art of Welding by Irving Rathwell, Lorain Community College
- The Education and Training of Welders in Ireland by Eddie Donohoe, School of Construction Linen Hall, Dublin, Ireland
- Welder Training in Australia by Chris Smallbone, Executive Director of WTIA, Silverwater, Australia
- Teaching Welding to Students Whose Second Language is English by Lisa Wittenberg

WEDNESDAY, MAY 9

Session E3: Lincoln Electric Co. Off-Site Demonstration for Welding Educators Only

1:00 p.m. - 5:00 p.m.

Live welding will be demonstrated at the Lincoln Electric Company, which will run some of its hottest welding techniques on titanium and other metals. This is an off-site event for welding educators only, with transportation provided. Hands-on opportunities available.



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EXPO HOURS

Sunday, May 6 — Noon-5 pm

Monday, May 7—9 am-5 pm

Tuesday, May 8—9 am-5 pm

Wednesday, May 9—9 am-5 pm

Thursday, May 10—9 am-3 pm

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