Jake Welch Detroit Stoker Company Director of Engineering



Preparation & Execution of Equipment Inspections and Repair Outages

Agenda

- Brief Detroit Stoker Company overview and capabilities
- Pre-outage planning
- Safety start to finish
- Inventory, preparing and staging equipment
- Knowing the total outage scope of work
- Accounting for planned power outages
- Maintaining work area



Est. 1898 - Monroe, Michigan USA





Fuels Around the World





Detroit[®] Combustion Systems

Secondary Air System

Solid Fuel Feeding/Metering

Ash Handling

- Aftermarket parts & Services
- Additions/Betterments/Conversions
- Engineering Studies



Gas/Oil/Dust **Burners** Secondary **Air System Solid Fuel Stoker Grate** System

Primary Air System

Solid Fuel Combustion Systems

Spreader Fired Combustion

- Detroit[®] RotoGrate
- Detroit[®] Rotostoker type VCG
- Detroit[®] HydroGrate



Rotostoker Type VCG





HydroGrate



Solid Fuel Combustion Systems



GTS Grate



Reciprograte

DSC Equipment

We build grates and.....

• Burners

- o 15 300 MMBtu/hr Capacity
- \circ Multiple fuel options
 - Natural Gas
 - Propane
 - Biogas
 - #2 #6 fuel oil
 - Waste oil
- Ash handling equipment







DSC Equipment

We build grates and.....

- Metering Equipment
 - Wood pellets
 - Bagasse Sugar Cane
 - RDF Refuse derived Fuel
 - \circ $\,$ Custom designed solutions for biomass $\,$

Distributors

- o Biomass
- o Refuse / waste products
- o Pellets
- o **Coal**
- Secondary Air Systems
- Replacement parts for fluid bed and other grates





DSC MR (Maintenance & Repair) Focus

- Early 90's identified issues/opportunity with maintenance of DSC equipment
 - Holds true for most powerhouse equipment related to power generation and steam
 - Becoming more prevalent with talent gap on labor
- Started MR offering to support customer annual outages and any emergency equipment repairs
 - Providing OEM expertise with preferred contractors to manage portion of mill/plant outages



Lessons learned over 30+ Years as OEM providing labor

- Steps to successful combustion system maintenance
- Important to review history of maintenance, documentation, past reports.
- Planning ahead for having necessary materials and parts on site.
- Important to thoroughly document findings during outage for future reference and outages.



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Pre-outage planning

- Timeframe for work to be completed?
- Job schedule?
 - Is work contingent on boiler shutdown and start up.
 - Any work that can be completed prior to boiler shutdown.
- Manpower requirements
 - Around the clock coverage?
 - Site safety requirements supervisor, hole watch, fire watch?
 - Find the right contractor





Additional Outage Support

- Electrical
- Refractory repair/replace?
- QA/QC Plans 3rd party required?
 - Welds Dye penetrant, mag particle, x-ray, etc.
 - Fasteners
 - Other
- Asbestos/Lead Paint Abatement?





Jobsite Safety

- Site-Safety Compliant Prior to Arrival
 - TappiSafe, ISNetworld, Plant Specific
- Personnel properly trained and prepared
- Daily Tool Box Talks
- Daily JSA's
 - Identifying Hazards Related to Work
 - Confined Space, House-Keeping, Slips/Trips/Falls, Electrical, Hot Work, Etc.
- Permits Hot work, confined space, etc.

- Accommodations for On-Site Safety Representative
- Hole Watches / Fire Watches included in crew lists
- Confined Space Atmospheric
 Monitoring
- OSHA/MSHA Compliance
 - Standard PPE along with any plant
 Specific PPE
 - FR, Escape Respirator, Fall Restraints, H2S Monitors, Etc.
- Daily Shift Change Meetings & Overlap

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Safety Checklist

Safety Checklist								
	Y	N		Y	N		Y	N
FIRE PROTECTION PRECAUTIONS	X		PPE NEEDED			ENERGIZED EQUIPMENT SECURED		
Fire Blankets	X		Hard Hats	Х		Ground Fault Protection (GFCI)	Х	
Welding Screens	Х		Safety Glasses	Х		Lock Out Tag Out (LOTO)	Х	
Flammables Removed	X		Hearing Protection	Х		Electrical Tools/Cords Inspected	Х	
Suitable Fire Extinguishers	Х		Safety Toe Shoes	Х		High Voltage Lines Identified	Х	
LEL Measured	Х		Gloves (for Specific Hazard)		Х	Hot Pipes Need Temp. Insulation		Х
Trained Firewatch Stationed	X		Face Shield		Х	Cords/Hoses/Leads Elevated 7*	Х	
			Fall Protection Equipment	Х				
PERMITS REQUIRED			Monogoggles		Х	WORK PLATFORMS FOR TASK		
Work Permit	X		Chemical Suits		Х	Scaffold Needed/Inspected	Х	
Hot Work	X		Respiratory Protection	Х		JLG/Scissor Lift (Oper. Cert.)		Х
Line Break		X	Foot/Metatarsal Guards		Х	Ladders (Inspected and Secured)	Х	
Personnel Basket		X	Safety Shower		Х	Other:		
Confined Space Entry	X		Eye Wash	Х				
Rail Work-Derailer/Blue Flag		X	Electrical Flash Gear		Х	BARRICADES NEEDED		
Pre-Lift Rigging	X		Rubber Boots		Х	Caution (Yellow)	Х	
Excavation		Х				Danger (Red)	Х	
Demolition	X		ABATEMENTS NECESSARY			Hard Barricade		Х
			Asbestos		Х	Flashing Lights		Х
			Lead Paint		Х			
			Other:					



Safety Traveling Grate JSA

This Potential Hazards list is to aid in filling out the JSA. Please note not all hazards may be listed. Please write correlating Letter in "Hazard" column below.					
Potential Hazards					
A. Electrocution/Shock	H. Hot Surfaces	O. Excavations	V. Chemicals (SDS Review)		
B. Fall From Heights	I. Pinch Points	P. Lead Paint	W. Restricted Access/Confined Space		
C. Work Overhead	J. Flying Particles	Q. Silica Dust	X. Poor Lighting		
D. Lifting: Manual/Mechanical	K. Vehicle Traffic	R. Asbestos	Y. Heat Stress/ Cold Temperatures		
E. Rough/Sharp Material	L. Railway Traffic	S. Poor Work Position	Z. Compressed Air		
F. Slippery/Uneven Surfaces	M. Welding Fume	T. Noise	AA. Repetitive Motion		
G. Machinery – Rotate/Moving	N. Welding Arc	U. Flammable Materials	BB. Other:		

Activity Be sure to list all the steps in the sequence that they are performed.	Hazards A hazard is a potential danger. What can go wrong? How can someone get hurt?	Risk Control Measures Describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise, and specific.	Responsible Party or Person Responsible for implementing controls and performing the task.
De-energize and lock out all grate mechanical equipment, fuel delivery and combustion air fans	A,G	LOTO procedures required	Owner
Prepare grate system for removal of components.	W	Ensure boiler and plenum hopper are safe to enter. Confined Space permit required w/ check for gasses and O2 content	Owner
Remove all required access doors, including extension fronts	D,I,	Workers to have appropriate PPE. Slings and Come-longs, chains for lifting and supporting components	Owner
Erect Scaffold arrangement in plenum hopper for access to grate catenary for grate removal.	B,D,E,I,S,Y,W,X	Ensure water is available to mitigate Dehydration. PPE required	Owner
Begin removal of grate bars in catenary of grate to open maintenance opening in grate.	B,D,E,F,I,S,Y,W,X,AA	PPE, correct hand tools	Owner
Option 1 – Grate removal with Grate drive operating. Most common procedure with grate operating a lowest speed.	B,D,E,F,G,I,S,Y,W,X,AA	Worker awareness of moving equipment. Attention of Confined Space attendant. Ability to immediately de-activate grate	Owner

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Planning for lock out/tag out

- Lockouts
 - Traveling grates are required to be rotated during the outage to remove and reinstall grate bars, drive lockouts should be able to be easily removed.
 - HydroGrate's with independent cooling water circuits can be hydro'ed during the outage to identify leaks.





Outage Planning

Considerations for equipment storage

- Organization
 - Where are the parts?
 - I think we had some left over from last year?
 - They should be in that box somewhere....
 - Locate and inventory parts prior to outage!
- Parts being reused vs replaced
 - Daily clean up is important
 - Don't throw anything away until the work is completed
- How are parts getting up to the boiler
 - Prestaging parts is always best
 - Will access be limited during the outage?
 - Broken / busy elevators







Equipment/Material Storage

Considerations for equipment storage – Outdoor Storage

- Weathered parts require more preparation / clean up
- Part number tags damaged
- Illegible packing lists
- Fastener boxes fall apart
- Misplaced parts











Outage Planning

- Considerations prior to equipment Installation
- Storage duration
 - Nitrogen blanket
 - Protecting drive components Motors
- Pressure part cleaning
 - Vapor phase cleaning
 - Is steam access available?
 - Acid Cleaning
- Special tools or materials required?





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Shutdown Planning

- Cool down period
 - Running FD/ID fans to expedite
- Water wash and other boiler cleaning
- Vacuum trucks to clean grate surface and siftings hoppers
- 12, 18, 24 hours?

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Knowing the Total Scope

Maintaining Schedule

- Evaluating outage duration based on scope of work
 - In addition to the planned scope has time been accounted for discovery work
 - What extra parts are on hand?
 - Critical to track progress and maintain punch list of work remaining to be completed
- Proper planning reduces outage cost
 - Determine when the grate inspection can begin. Have the following been completed
 - Cool down
 - Lockout
 - Cleaning
 - Scaffolding
 - When are crews available to make repairs to the grate?



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Other work taking place in the area?

Working with Other Contractors

- What other work might interfere with repairs to the stoker?
 - Water Washing Problematic for traveling Grates
 - UT testing
 - Scaffolding erection / disassembly
 - Refractory repairs
 - Bark bin repairs
 - Boiler tube repairs
 - Overhead work

Equipment Access - Scaffolding

Equipment access and multiple trades

Scaffolding – Dance Floors above grate surface when extensive work to be completed.

Knowing the Total Scope

Manpower Requirements

- Due to limited available space having more hands inside is not always better
- Millwrights
 - Traveling grate 2 per bay
 - Vibrating grate 4 per module
- Additional personnel outside boiler for support
 - Staging parts
 - Gathering tools
 - House keeping
 - Hole watch / fire watch
- Required equipment/tools
 - Torches, stick welder, pallet jack, forklift / telehandler, come-a-longs, chain falls, rigging, general hand tools (wrenches, sockets, hammers, punches, screw drivers), grinders

Knowing the Total Scope

Designate critical path of work that must be completed during current outage.

• Limit access to those who do not need to be in work area

Maintain punch list of items to be completed and update as items are completed.

Site wide planned power outage

Planned power outages are typical.

Be prepared so work will not be disrupted during these outages.

Maintain work area

- Keep work area clean.
 - Walkways clear.
 - Hoses and power cords up and out of the way.
- Tools and parts organized.
- Move scrap and trash away in a timely manner.
 - Have a plan for material disposals

Final Clean Up

- Ensure tools, spare parts, fasteners, debris are removed from any work areas
- Work area should be cleaner than it was found
- Hand off back to operations/maintenance staff
 Locks off!

Documentation and Reporting

- 2026 outage planning starts during 2025 outage
- Documentation and reporting of findings with recommendations for scope for following year
- Needs to be clear and concise
- Procurement of materials can't start too soon

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Equipment Training

- Increasing demand for equipment training with new/younger operations and maintenance staff
- Stressing importance of operations and maintenance working together to understand the equipment

DSC History @ Eastman Kingsport

Design Parameters	Boilers 18, 19, & 20	Boilers 21 & 22	Boilers 23 & 24
DSC Job No	RG-279, RG-301 & RG-318	RG-418 & RG-492	RG-630 & RG-706
Steam Load Max (Klbs/hr)	150	160	340
Grate Size	17'-7 1/2 "W x 17'-8"L	23'-1 ½" W x 17'-8" L	32'- 1 ½" W x 22-2" L
# Grate Bays	5	6	8
Coal Feeder type	(5) 18" Reciprocating	(6) 27" Reciprocating	(8) 27" Underthrow
Coal Input Max (lbs/hr)	15,300	15,500	35,170
Sludge Injection	Yes – Front wall steam atomizing nozzles	Yes – Front wall steam atomizing nozzles	Yes – sidewall (2/side) atomizing nozzles
Chemical Injection	Νο	Νο	Yes – Rear wall steam atomizing arrangement

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Thank You

Questions/Comments?