High Production Automotive Foundry

SO2 Gassing System

Case Study

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Introduction

Many foundries use the Epoxy Acrylic Cold Box chemical system to produce cores. This process uses SO_2 as the catalyst to cure the core. The typical facility using the ISOSET® is a high production automotive supplier. There have been two major advancements in SO_2 curing over the last several years. The first is to blend the SO_2 with N_2 to reduce core residual and environment PPM's. The second is to super heat the blended gas which reduces gassing times and increases core tensiles.

General Foundry Information	
Product Line:	• Diesel Blocks • Diesel Heads • Gas Blocks • Exhaust Manifolds • Intake Manifolds • Transmission Gears • Connecting Rods • Steering Housings • Pistons
Casting Metal Type:	• Grey Iron • Malleable Iron • Aluminum
Melting Facility:	• Induction • Electric Arc
Core Processes:	• Epoxy Acrylic
Molding Processes:	• Green Sand

Project Objectives
Improve Process Repeatability
Reduce Environmental Problems
Improve Machine Productivity
Simplify Handling of SO_2

Original Problems
Inaccurate/Inconsistent Vaporizing of SO_2 Liquid
Higher than desired PPM Employee Exposure Levels
High Residual SO_2 being released from cores

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Hardware Configuration

Installation typically includes a SO_2 Vaporizer, Blender, Super Heater and Analyzer System to provide blended SO_2/ N_2 to the central gassing header. Optionally, each core machine station can be equipped with a gassing tank to enable each machine to operate at a different gassing pressure.

- **Vaporizing System** - provides a supply of vaporized SO_2 to the system and allows for the complete emptying of the liquid cylinder for uninterrupted operation during cylinder changes.
- **Blending System** - gives the flexibility of changing the ratio of SO_2/ N_2 Gas used during the gassing cycle. This mixture of SO_2 and N_2 results in lower residual PPM's.
- **Super Heater** - provides the ability to elevate the blended gas up to over 200F. This hotter temperature speeds the curing process and creates a higher core tensile.
- **Online analyzing** - of gas ratios provides continuous monitoring and recording of process changes
- **Surge Tanks** - individual core machine gas surge tanks allow for changes in gassing pressure requirements to accommodate for different requirements in jobs or tooling needs. Online diagnostics provides guides in the event of alarm situations. There are also built in provisions for operator and system safety.

Core Information from Customer Foundry	
Number of SO_2/N_2 Blending Systems	1
Number of Core Machines	7
Approximate blow capacity ranges	1 lb. to 60 lbs.
Average Machine Cycle	N/A
Gassing Times	1.0
Purge Time	15-18 sec.
Gassing Pressure	15 to 18 PSI
Purge Pressure	25 PSI
Avg. SO_2 usage	16 Lbs/Ton of Mixed Sand

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Results and Benefits from Customer Foundry	
Reduction in SO_2 core residuals by	100% to 55%
Reduced core scrap by (scrap is based on inventory vs. actual production cycles)	.5%
Increased productivity by reducing purge times (Over 53% reduction)	Before = 15-18 sec. After = 7-8 sec.
Lower environmental PPM exposure levels produced fewer SO_2 alarms per day	Before = 50-150 PPM After = 1-5 PPM
Lower residual SO_2 released from new cores	70% reduction
Higher Transverse strength in a selected test core	Before = 15.5 PSI After = 21 PSI (35.5% increase)
Constant control of gassing PSI with the ability to change gassing PSI from operator interface for any given machine setup requirement or conditions	
Better gas flowability through cores	
Built in reliable safety features meet AMSE requirements	
State of the art process control	
Reduced resin wipe off on core box resulting from better curing	
Highly improved ease of isolating the system for repairs and maintenance	

System Justification
Improved environmental exposure levels
Lower purge cycle times have increased machine productivity
Better competitive position in the market place
Lower air compressor energy usage resulting from lower purge air times