



Mulch coloring equipment

A technological evolution

Presenter:

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Technical Service Manager, BASF/Colorbiotics



David Roller

Technical Service Manager, BASF/Colorbiotics

- **Twenty-six years with Colorbiotics**
- **Colorant systems manager for the last 15 years**
- **Introduced more than 50 pieces of equipment to the industry**
- **Worked on approx. 250 mulch yards**



Origin of colored mulch

- **Pallet material waste**
 - Biggest single source
- **Can't be burned anymore**
 - New regulations
- **Needed to get rid of scrap wood**
 - Piles of scrap were becoming an issue



Evolution of mechanical and control technology

- **From low-tech, modified, existing technology machines**
 - Manual controls
 - Variety of manufactured and homemade machines
 - Rely on human judgments
- **To high-tech, machines designed specifically for mulch**
 - Increasing computer control over entire system
 - Decreased reliance on guesswork, intuition
 - Production/maintenance data at your fingertips
 - Database – production reporting – trending



Equipment and technology

1990 – 1996

 **Colorbiotics®**

N-Viro Mulch Coloring System

- **Manufactured by Morbark LLC**
 - Water/colorant injected at the bottom of the auger
 - “Bath” system
 - Very wet finished product
 - Poor coverage
 - Low output: 40 – 70 yds/hr.
 - Hydraulic driven
 - Underpowered
- **Other machines at this time:**
 - Kurtz Brothers
 - Screw auger

1990



WNC Machines

Pro Series

- **Twin ribbon blender**
 - Single motor – gear driven
- **Required feed system**
 - No hopper
- **Outputs from 90 – 200 yds/hr.**
- **Extra-dry advantage**
 - Maximized color/water distribution

1992 – 1999



Paddle Mixers

Becker Underwood

- **SH-30**
 - Output 30 yds/hr.
 - Built-in hopper
 - Skid loader feed
 - Limited production
 - First overseas sales – Becker Underwood

1996



Paddle Mixers

Becker Underwood

- 80 – 150 yds/hr.
- 10 – 15 gal/yard
- Electric
- Bi-lateral agitation
- Maximized water/colorant distribution
- Hundreds sold
- First commercial mobile units produced with the diesel hydraulic SH-200

1996 (NOV)



Grinders

- **Added water/colorant to Hammermill**
- **Single machine for grinding and coloring**
- **Various manufacturers**
 - Roto Chopper led the way
 - Manufacturers and customer modified existing grinders to coloring machines

1997



Batch Machines

- **Mix mulch, water and colorant as a set batch**
- **Load raw material inputs in proper order, mix until materials blended, quality met**
 - Once a batch is completed, machine is unloaded and process starts again
- **Various manufacturers**
 - Fecon
 - Knight Mixer
 - Morbark

1997



Trommels

- **Producers upgraded existing screens to color mulch**
 - Installed manifolds
 - Utilized pump systems
 - Blocked off screens
- **Mulch Manufacturing, OH – WNC**
 - Assisted in converting trommel screen for coloring
- **Currently various screens manufactured with coloring in mind**

1998



A close-up photograph of a hand wearing a blue nitrile glove, holding a small piece of wood. The hand is positioned over a large pile of wood chips or mulch. The background is dark, and the lighting is focused on the hand and the wood chips.

Advances in technology

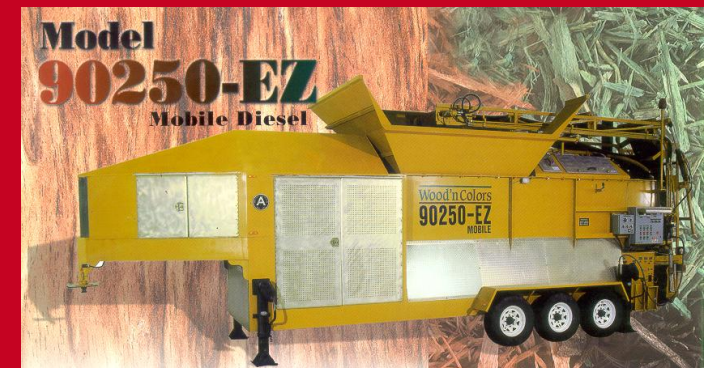
1999 – 2003

WNC

Model 90250

- **Introduced as an upgrade of the WNC Pro Series**
 - To compete with the Becker Underwood SH-200
- **Independent shafts in the hopper and mixer sections**
 - Variable speed drives to adjust rpm of each section
- **Two models**
 - Electric stationary
 - Diesel hydraulic mobile
- **Sold by both WNC and Becker Underwood**

1999 – 2001





Auto controls

Single-person operation

- **Available on both electric and diesel hydraulic models**
- **Automatic starting as hopper is filled**
- **At set level, machine will stop and wait in automatic standby**
- **All inputs (mulch feed, water, colorant) were controlled by this system**
- **Two modes of operation: manual and automatic**
- **Remote controls – allowed control of machines from loader cab**

Sahara[®] X Series

- **Larger, faster, easier to operate**
 - Redesigned mixer section
 - Dual arms and blades – increased agitation
 - Air atomization of colorants
 - Dual manifolds
 - Auto controls
 - Outputs at 300+ yds/hr.
- **30% less water usage**
- **Patented**
- **Quickly became sales leader**
 - Over 250 units still running today

2000



Sahara



Advances in technology

2004 – 2009



 Colorbiotics®

Global Equipment Management (GEM) system introduced

- Volumetric controls
- User documents on screen at machine
- Connects to X Series machines
- Controls water and colorant to maintain consistent application

2004





GEM advances

The next step toward fully automating the color application process

- **Using technology to minimize inputs and maximize outputs**
 - Using only enough colorant and water to produce quality mulch
- **Connecting constant, computerized controls to operating systems**
 - Utilize existing auto controls
 - Increase quality control
 - Improve efficiency
 - Maximize production
 - Minimize user error



Safety controls advancement

- **Increased safety features**
 - Multiple operator resets required for operation
 - At startup
 - After E-stop event
- **Redundant sensors**
 - Eliminate false starts
 - Bridge detection functions
- **Improved central safety controls**
 - Safety controls that cannot be bypassed
- **Improved door monitoring sensors**
 - Required for operation
 - Incorporated into central safety control system
- **Secondary manual locks for extra safety**

Improved wear parts

- **Blades**

- Durablades

- **Liners**

- Standard on all X Series machines in 2005
- AR 400 steel
- Replaceable, eliminates wear to structural trough of the machine

2005



Infusion/CM-200 (pump stand)

- Self-contained water/colorant control
- Connects to grinders, trommels, etc.
- Powered by either 120 vac or 12 vdc
- Includes
 - VFD – controls color pump speed
 - Flow meter – measures water volume – gpm
 - Remote control option available

2005



 Colorbiotics®



Advances in technology

2010 – 2012

GEM 2.0 introduced

- **Another step toward full automation**
- **Recipes**
- **User documents on screen at machine**
 - SOPs, troubleshooting
- **GEM database designed**
 - Central data collection point for production
 - Maintenance data per machine
- **Reporting to operators/managers daily**
 - Email
- **Customer access to database for custom reporting**
 - Multiple site access for customers
- **Remote machine access provided**

2010





Advances in technology

2013 – 2018

 **Colorbiotics**® Sahara® Pro

 **Colorbiotics**®

Sahara Pro

- **Designed on the GEM platform to allow greater computer control with easier operation**
 - Volumetric infeed
- **Water atomization of colorants**
 - 30% less water than the Sahara X Series
- **On-demand injection system**
- **Connected to GEM database**
- **Much-improved maintenance access**
- **Patented**
- **Bar code inventory functions**

2013



GEM 3.0

- Improved operator interface
- Real-time alerts and notifications to operators/managers
- Improved and customizable reporting
- Pump calibration tools and user settings
- Upgradable to existing GEM and Pro units in the field
- Improved remote access for customers and troubleshooting

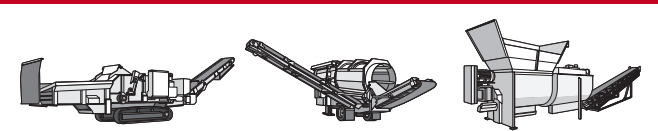
2014



GEM LT

- **Volumetric measuring for conveyors, screeners, grinders, etc., that are not necessarily coloring**
- **Reporting to and from GEM database**
 - Email reporting
- **Input power – 12/24 vdc or 120 vac**
 - PLC controlled with 8" color display
- **Compatible with any grinder, screener or coloring machine with a conveyor**

2016



Future technology



GEM 4.0

- **Further improvements on GEM platform – increased computer integration**
 - Improved parts ordering platform
 - Access at the operator panel of the machine
 - Exploded views of all parts and assemblies
 - Ordering from operator panel possible
 - Service/troubleshooting manuals accessible from machine display
- **Customizable reporting and mapping**
- **Maintenance checkoff at the operator panel of machine**
- **Auto-calibration of pumps**
- **Improved HMI display, redesigned screens based on user feedback**
- **Changes to production screens**
 - Lbs. used
 - Yards produced
 - Water consumed
- **Expanded database to provide faster networking, larger storage capacity per machine and more reporting customization**
- **Existing GEM systems in the field can be upgraded**

The screenshot displays the GEM 4.0 HMI interface. At the top, there is a navigation bar with icons for Home, Previous Screen, Recipes, Average & Trends, Navigation, and LogOn. The main area features a 3D model of the machine with several circular callouts for 'Feed Hopper Details', 'Water Output Details', 'Pump Details', 'Mixer Details', 'Air Compressor Details', 'Scale Details', and 'Conveyor Details'. To the right of the 3D model is a data table for 'Saddle Brown'.

	Setpoint	Actual	Average	
Mulch Feed Rate	310.00	0.00	0.00	YPH
Water Input Rate	12.00	0.00	0.00	GPY
Colorant Input Rate	4.00	0.00	0.00	LBS/YD
Additive Input Rate	0.00	0.00	0.00	LBS/YD

At the bottom of the interface, there is a status bar with the following information: 09/23/2019 13:30:14, CBPR000-BU1609, Ames, Ia, User: operator, Run Mode: MANUAL.

Colorbiotics personnel investment

▪ **Field Operations Analyst**

- Watch real-time data as directed by customers
 - Daily monitoring of all GEM/Pro machines
 - Notification if out of tolerance
 - Trending of data
 - Reports provided to customers
 - Proactive troubleshooting
 - Emailing of customer desired data

▪ **Colorant Systems Technician**

- Additional field technician in South Central area of the U.S.
- Improve response time
- Reduce travel time



Improved Sahara X Series

- Improved water usage over current X Series
- Improved, integrated feed system
- Built on GEM platform – best yet integration of hardware (machine) and software (GEM controls)
 - Incorporate GEM/Pro 4.0 technology as standard
 - Single panel design
- Moisture detection
 - Further enhance water control as raw material moisture changes
- Reduced wear and power requirements
- Will be patent protected





Q&A

