



BACK TO THE FUTURE!

UV/EB TECHNOLOGY AS A SUSTAINABLE SOLUTION
TO THE ENERGY CRISIS

Cara Bommarito

Sustainability Manager
RadTech North America

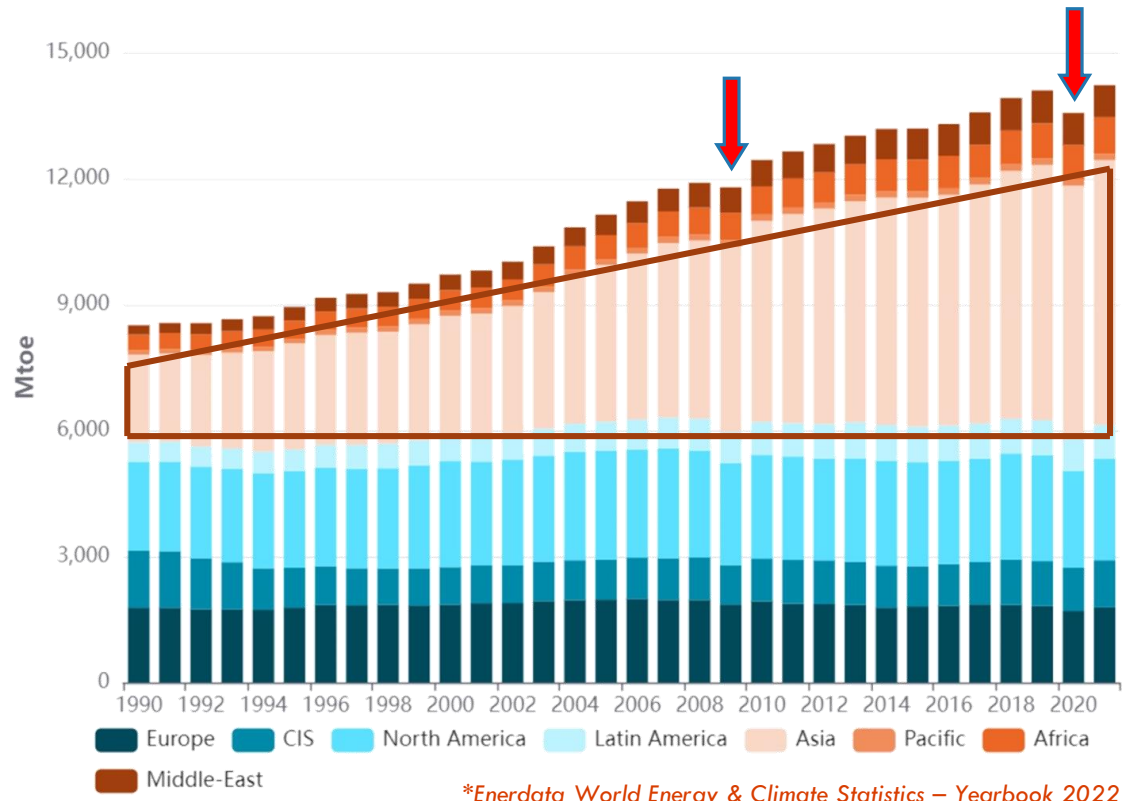
Michael R. Bonner

VP – Engineering & Technology
Saint Clair Systems, Inc.



WHY IS ENERGY THE ISSUE?

WORLD ENERGY CONSUMPTION BY REGION



**Enerdata World Energy & Climate Statistics – Yearbook 2022*

- ANNUAL GLOBAL DEMAND FOR ENERGY HAS INCREASED BY MORE THAN 67% SINCE 1990
- TWO REDUCTIONS OVER 3 DECADES
 - 2020 PANDEMIC
 - 2009 GREAT RECESSION
- THE LARGEST GROWTH IS IN ASIA

WORLD ENERGY CONSUMPTION BY REGION

Year: 1990	Unit: Mtoe	Year: 2021	Unit: Mtoe	Change
United States	1,910	China	3,652	318%
Russia	879	United States	2,123	11%
China	874	India	927	231%
Japan	439	Russia	811	-8%
Germany	352	Japan	400	-9%
India	280	Brazil	308	118%
Ukraine	251	South Korea	298	217%
France	224	Canada	289	37%
Canada	211	Germany	286	-19%
United Kingdom	206	Iran	274	297%
Italy	146	France	235	5%
Brazil	141	Indonesia	226	128%

- TRIPLE-DIGIT GROWTH IN CHINA, INDIA, SOUTH KOREA, IRAN, INDONESIA
 - RESULT OF INCREASED INDUSTRIALIZATION
- REDUCTIONS IN GERMANY, JAPAN, RUSSIA
 - RESULT OF CONSERVATION EFFORTS
- SOUTH KOREA, IRAN, INDONESIA NOT IN TOP 12 IN 1990
- ITALY, UKRAINE, AND THE UK NO LONGER IN TOP 12
 - PUSHED OUT BY ASIA & CONSERVATION

*Enerdata World Energy & Climate Statistics – Yearbook 2022



THE ENERGY CRISIS

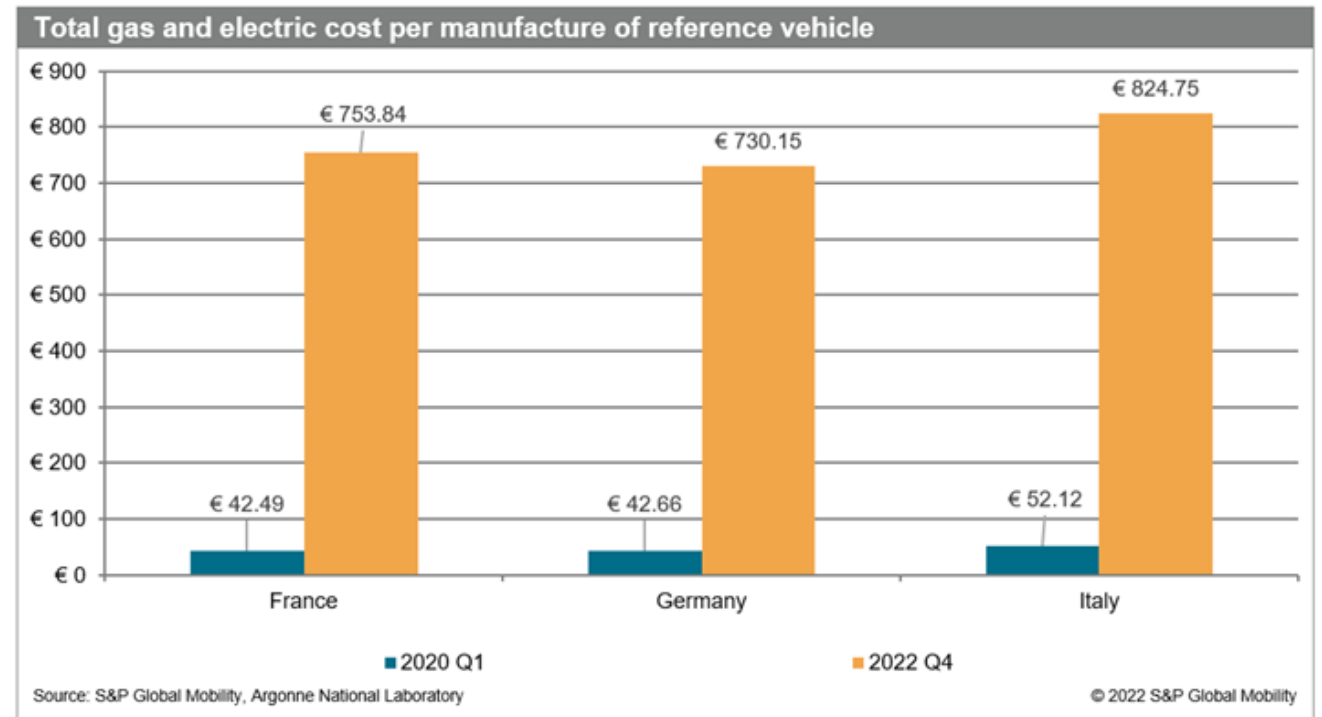
THE ENERGY CRISIS

*“GLOBAL ENERGY MARKETS ARE IN AN UPHEAVAL
LED BY GEOPOLITICAL CONFLICTS,
MACROECONOMIC ISSUES SUCH AS HIGH
INFLATION RATES, AND SUPPLY DISRUPTIONS.”*

- The Adhesive & Sealant Council
(November 2022)

THE EUROPEAN CONUNDRUM

- IN OCTOBER 2022, GARY VASILASH OF GARDNER BUSINESS MEDIA'S *on AUTOMOTIVE* WROTE,
 "...SINCE Q1 2020 NATURAL GAS PRICES IN ITALY, GERMANY, FRANCE AND THE UK HAVE INCREASED AN AVERAGE 2,183%. WHOLESALE ELECTRICITY PRICES ARE UP 1,230%."
- THIS HAS DRIVEN UP THE COST OF ENERGY TO PRODUCE A CAR IN EUROPE BY ~1700%.



EUROPE'S NOT ALONE

“POWER SHORTFALLS COULD BE RIFE OVER THE NEXT THREE MONTHS ACROSS A LARGE PORTION OF THE NORTH AMERICAN BULK POWER SYSTEM (BPS), PARTICULARLY DURING EXTREME AND PROLONGED COLD CONDITIONS.”

- North American Electric Reliability Corp.
(November 2022)



THERMAL CURE vs. ENERGY CURE

THERMAL CURE vs. ENERGY CURE

- THERMAL CURE (CONVENTIONAL)

- SOLVENTBORNE, WATERBORNE, POWDER COAT
- CURED BY BAKING
- HIGH ENERGY CONSUMPTION
- VOLATILE ORGANIC COMPOUNDS
 - FLAMMABLE
 - HAZARDOUS
 - REMEDIATION REQUIRED

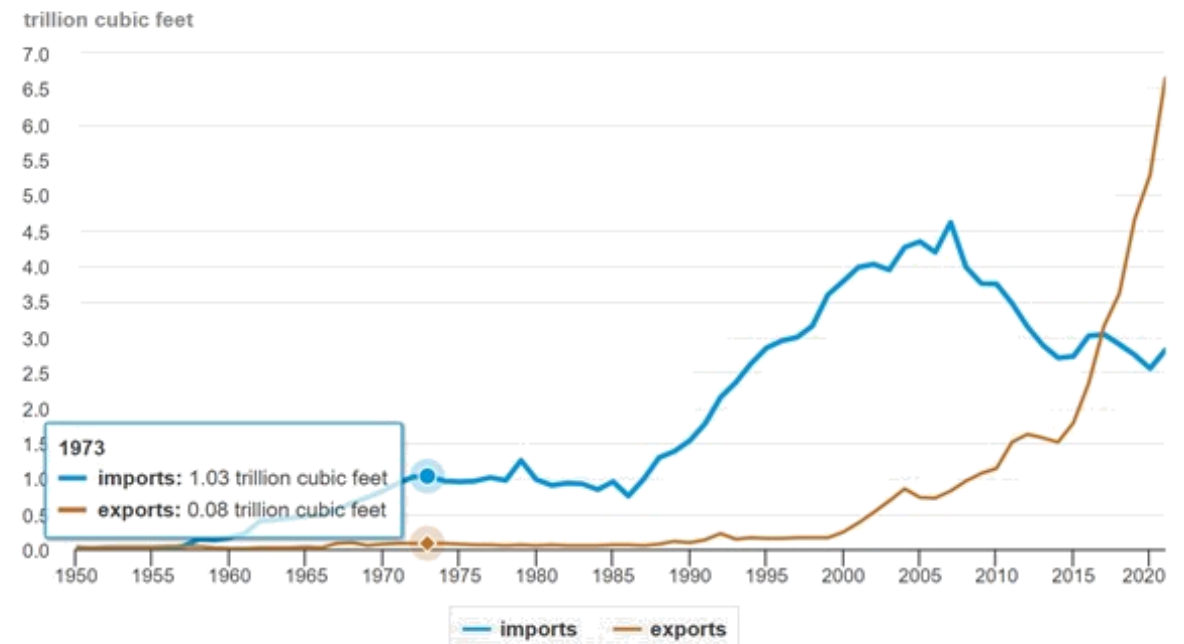
- ENERGY CURE

- UV, UV-LED, ELECTRON BEAM (EB)
- CURED BY LIGHT WAVES OR HIGH-ENERGY ELECTRONS
- LOW ENERGY CONSUMPTION
 - UP TO 95% LESS!
- 100% SOLIDS (NO SOLVENTS USED)
 - NO VOC'S
 - NO REMEDIATION REQUIRED

THE HISTORY OF ENERGY CURE TECHNOLOGY

- ELECTRON BEAM TECHNOLOGY
 - EDWIN NEWTON - B. F. GOODRICH
 - VULCANIZING RUBBER
 - US PATENT FILED IN 1929
 - STILL IN USE TODAY
- UV TECHNOLOGY
 - DEVELOPED IN THE 60'S
 - COMMERCIALIZED DURING 70'S
 - DRIVEN BY 1973 OPEC OIL EMBARGO

U.S. natural gas imports and exports, 1950-2021



eia Data source: U.S. Energy Information Administration, *Natural Gas Annual*, September 2022

THE RISE OF UV TECHNOLOGY

“THE COMMERCIALIZATION OF UV CURABLE INKS IN THE 1970’S ENABLED BEVERAGE COMPANIES TO ACCOMMODATE A REDUCED AVAILABILITY OF NATURAL GAS WITH A TECHNOLOGY THAT DEPENDED SOLELY ON READILY AVAILABLE ELECTRIC ENERGY.”

- HG Experts



THE BENEFITS OF ENERGY CURE COATINGS

PROCESSING & PERFORMANCE BENEFITS

- LOWER ENERGY USAGE
- NO VOC'S
 - NATURALLY SUSTAINABLE
- DURABILITY
 - SUPERIOR PROTECTION
- SPEED
 - INSTANTANEOUS CURING
- FIRST PASS YIELD
 - FEWER HANDLING ISSUES
- FOOTPRINT
 - SYSTEMS ARE MUCH SMALLER
- LESS WASTE
 - CAN COLLECT AND REUSE
- CLEAN ENERGY SUPPORT
 - REDUCED DEMAND ON GRID

REGULATORY BENEFITS

- FEDERAL, STATE, AND LOCAL GOVERNMENTS RECOGNIZE UV/EB COATINGS AS COMPLYING WITH VOC AND HAP RESTRICTIONS
 - EPA REPORTED UV COATINGS FOR METAL CAN APPLICATION CONTAIN LESS THAN 0.01 VOC/GALLON
- COORS REPORTED NO SIGNIFICANT EMISSION OF OZONE OR OTHER UNDESIRABLE EMISSIONS FROM A UV CAN LINE AT ONE BILLION CANS/YEAR
- IN 2019, THE CALIFORNIA STATE SENATE FORMALLY ADOPTED A RESOLUTION RECOGNIZING UV/EB TECHNOLOGY AS A POLLUTION PREVENTION PROCESS
 - EMIT LITTLE TO NO HARMFUL EMISSIONS
 - NO VOCs OR HAPs GENERATED
 - NO COMBUSTION CONTAMINANTS SUCH AS NO_x, SO_x OR GREENHOUSE GASES

REGULATORY BENEFITS

- SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)
 - ORANGE COUNTY AND THE URBAN PORTIONS OF LOS ANGELES, RIVERSIDE AND SAN BERNARDINO COUNTIES
 - SECOND MOST POPULATED URBAN AREA IN THE UNITED STATES
 - ONE OF THE SMOGGIEST
- NEW PLAN TO ACHIEVE AIR QUALITY REQUIRED EVERY THREE YEARS
- PLAN INCLUDES UV/EB/LED AS A MEANS TO IMPROVE AIR QUALITY
- IN 2005 A CLEAN AIR AWARD WAS PRESENTED BY THE SCAQMD TO RADTECH FOR
 - ADVANCEMENT OF AIR POLLUTION CONTROL TECHNOLOGY
 - EXEMPLARY LEADERSHIP, INNOVATION AND FORESIGHT



SUCCESS STORIES

CAN MAKING

- IN THE 1970'S, UV ALLOWED BEVERAGE COMPANIES TO COMPENSATE FOR THE REDUCED AVAILABILITY OF NATURAL GAS BY TURNING TO ELECTRICITY
- COMPANIES LIKE COORS TURNED TO UV INKS TO REDUCE ENERGY AND OPERATION COSTS
 - REALIZED SAVINGS >\$1M/YEAR

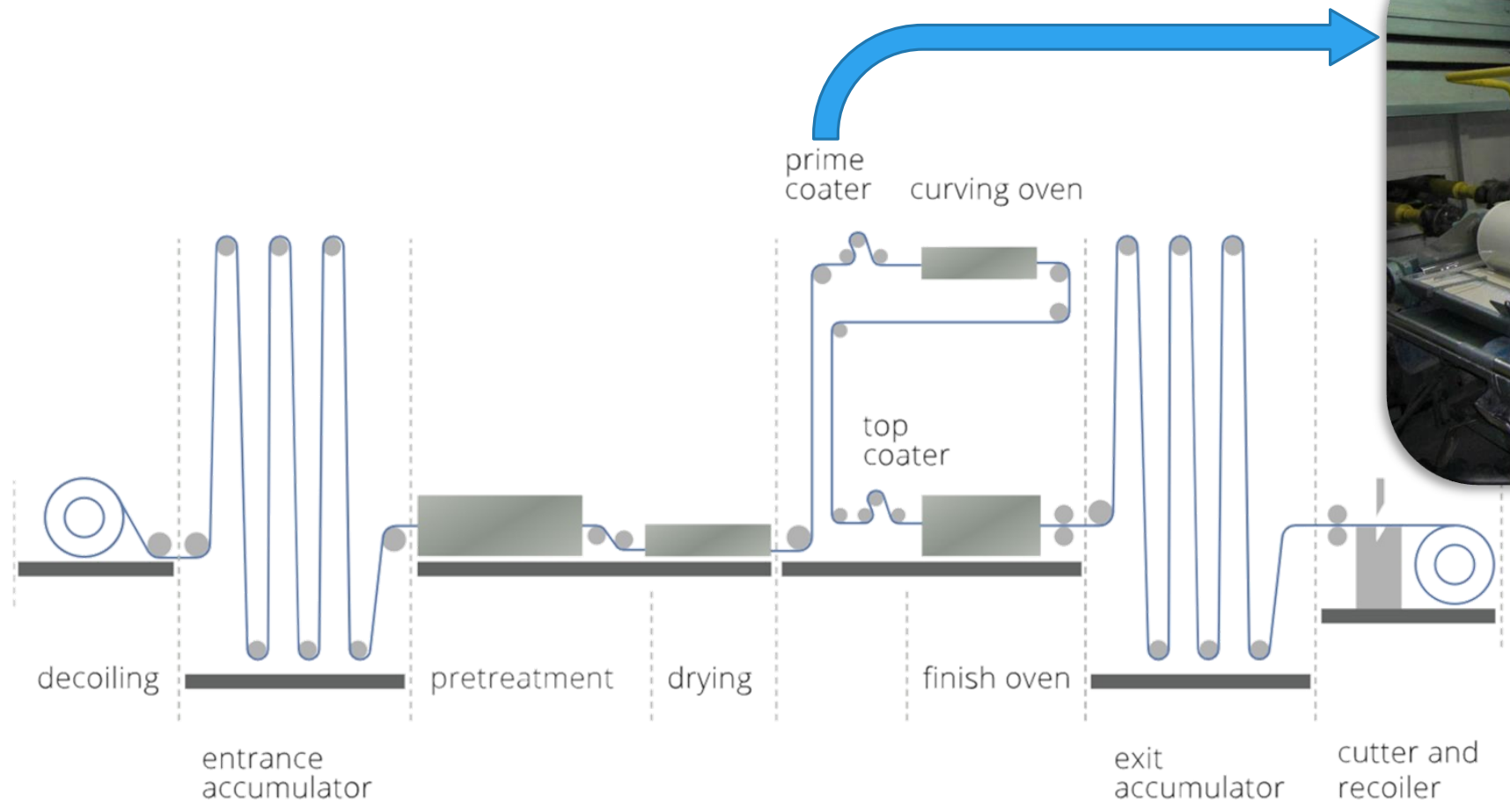


PRINTING

- CLEAR COAT IN FOUR-COLOR PRINTING PROCESS
 - ELIMINATES SPRAY POWDER
 - PREVENTS OFFSETTING / BLOCKING
 - ELIMINATES PROCESSING DELAYS
 - INCREASES PRODUCTIVITY
 - INCREASES PROCESS VERSATILITY
- UV INK SIGNIFICANTLY INCREASES THROUGHPUT
 - REDUCES COST WHILE INCREASING REVENUE

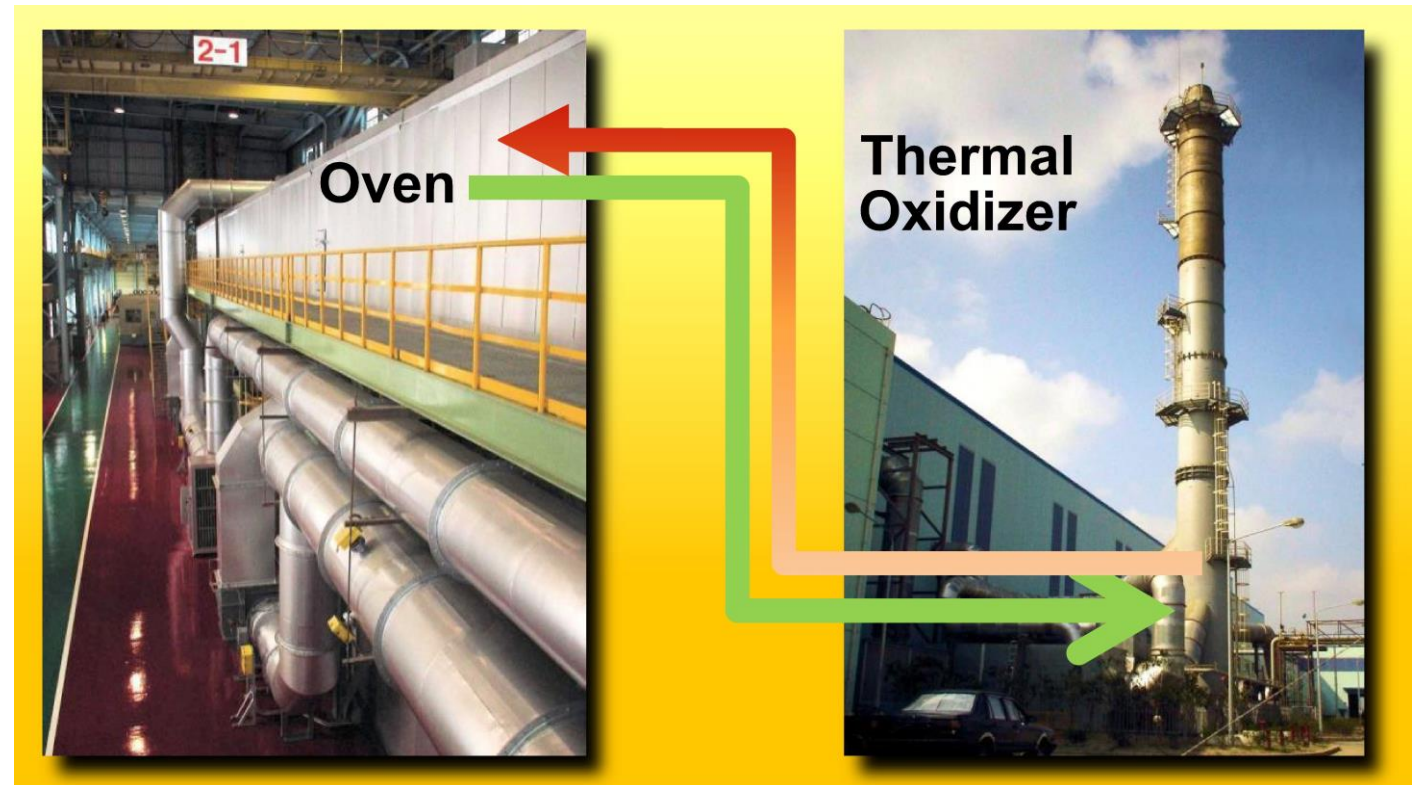


COIL COATING



COIL COATING

- TRADITIONAL IMPLEMENTATION
 - CONVENTIONAL COATINGS
 - BAKED ON
 - LARGE OVENS
 - VOCs TO DEAL WITH
 - INCINERATION
 - RTOs
- HUGE ENERGY DEMANDS
 - ~80% OF PLANT USE



COIL COATING

- PCT E-BEAM AND INTEGRATION
- ALUMINUM COIL COATING LINE
- CONCERNS WITH ENERGY USAGE

Coil Coating Line Cost Data	
Operating Hours (hrs/yr)	5,300
Cost of Labour (\$/hr)	65.00
Cost of Electricity (\$/kWh)	0.125
Cost of Natural Gas (\$/Kwh)	0.044

Coil Coating Line Operating Data	
Substrate	Aluminium
Strip Width (mm)	1,850
Strip Thickness (mm)	1.5
Speed (m/min)	60
Initial Metal Temperature (°C)	30
Required Peak Metal Temperature (°C)	241
Coating Formulation	Solvent
Coating Wet Film (μ micron)	20
Coat Volume Solids (%)	50

- 130KW EB UNIT REQUIRED
- NO SOLVENTS
- NO VOCs / NO RTO

COIL COATING

- CONVENTIONAL SYSTEM OVEN & RTO ENERGY REQUIREMENTS
 - ELECTRICITY
 - NATURAL GAS
- 130KW EB UNIT < 189KW
- ALL OTHER ENERGY REQUIREMENTS REMAIN UNCHANGED
 - MOTORS
 - HVAC

Drying Energy Requirements:	
Metal Heat-Up (kW)	1,454
Water Heat-Up (kW)	4
Evaporation (kW)	7
Coating Heat-Up (kW)	3
Total Required Drying Power (kW)	1,468
Convection Oven Efficiency	22%
Total Required Oven Power (kW)	6,671
Oxidizer Natural Gas (kW estimated)	850
Total Natural Gas Required (kW)	7,521
Fan Motors (kW)	89
Water Quench (kW estimated)	100
Total Electric Required (kW)	189

COIL COATING

	EB System	Convection Oven
ENERGY COSTS		
<i>Electricity</i>		
Consumption Rate	130 kWH	189 kWH
Annual Consumption	689,000 kW	1,000,640 kW
Subtotal (per Year)	\$ 86,125	\$ 125,080
<i>Natural Gas</i>		
Consumption Rate	0 kWH	7,521 kWH
Annual Consumption	0 kW	39,860,694 kW
Subtotal (per Year)	\$ -	\$ 1,753,871
Total Annual Energy Used:	689,000 kW	40,861,334 kW
Total Annual Energy Costs:	\$ 86,125	\$ 1,878,951
Total Annual Energy Saved:	40,172,334 kW (98.3% Reduction)	
Total Annual Cost Savings:	\$ 1,792,826 (95.4% Reduction)	

CONCLUSION

OFTEN, THE SOLUTIONS TO OUR “NEW” PROBLEMS COME FROM THE WORK OF THOSE WHO CAME BEFORE US—OFTEN SEARCHING FOR ANSWERS TO AN ENTIRELY DIFFERENT SET OF PROBLEMS.

SO, AS WE LOOK AT THE PROBLEMS OUR WORLD FACES REGARDING ENERGY CONSUMPTION, POLLUTION, SUSTAINABILITY, CARBON FOOTPRINT, AND THEIR TANGLED RELATIONSHIP TO THE HEALTH OF OUR PLANET, IT SHOULD BE NO SURPRISE TO FIND SOLUTIONS HIDDEN IN WORK FROM THE PAST.

CONCLUSION

ENERGY-CURED MATERIALS ARE A GREAT EXAMPLE.

BORNE OUT OF NECESSITY EARLY IN THE INDUSTRIAL AGE, AND
ADVANCED THROUGH OUR LAST ENERGY CRISIS, THESE OFFER THE
OPPORTUNITY TO IMPROVE THE QUALITY AND PERFORMANCE OF OUR
PRODUCTS, STREAMLINE OUR MANUFACTURING OPERATIONS, AND
SIMULTANEOUSLY REDUCE POLLUTION AND OUR CARBON FOOTPRINT
– ALL WHILE SIGNIFICANTLY REDUCING OUR OPERATING COSTS.

This is the true definition of sustainability.



THANK YOU!!

Cara Bommarito

Sustainability Manager
RadTech North America

cara@radtech.org

www.radtech.org

Michael R. Bonner

VP – Engineering & Technology
Saint Clair Systems, Inc.

mbonner@viscosity.com

www.viscosity.com