

Innovative Coating Technology for Higher Fiber Drawing Efficiency (High Speed/Low Helium/LED)

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Agenda

- Who are we?
- Next generation coatings (High speed/low Helium/UV-LED)
- UV-LED fiber drawing trials and results
- Conclusions and Q&A

DSM, the Life Sciences & Materials Sciences company

115-year-old DSM, the global Life Sciences and Materials Sciences company, has done business in China since 1963. DSM is a global Life Sciences and Materials Sciences company active in health, nutrition and materials.



Annual net sales of around €10 billion



Over 15,000 patents



25,000+ employees worldwide



26 R&D locations worldwide
2,500+ R&D employees



Dow Jones Sustainability Index: At the top of the list six times since 2004



200 locations on five continents



Our business: Health, Nutrition, Materials

We use bright science to brighten people's lives

Health



Nutrition



Materials



Intermediates



DSM India - Overview



Markets



Growth Trends/Initiatives



Our Pride



Beyond Profits

People
Planet

DSM India - Markets

Material Sciences

Engineering Plastics

- ✓ Automotive (4Wheelers & 2Wheelers) -1
- ✓ General Industries -3
- ✓ Electrical



Dyneema

- ✓ Personal and Vehicle Protection -3
- ✓ Commercial Fishing
- ✓ Power Transmission



Dyneema®
With you when it matters

Functional Materials

- ✓ UV Coatings for Optical Fiber
- ✓ Somos® Resins for 3D Printing - SLA
- ✓ UV Inks for Optical Fiber

DeSolite®
Supercoatings



Life Sciences

Human Nutrition

- ✓ Pharmaceutical -4
- ✓ Dietary Supplement
- ✓ Food and Beverage

Animal Nutrition

- ✓ Poultry -2
- ✓ Aquaculture
- ✓ Dairy



DSM India - Our Pride

Building Safe Armours

Dyneema - protecting lives of 50000 Indian Soldiers



Building Awareness

Poshan Card - One DSM CSR initiative touching lives of 1.5 mio women by imparting them knowledge and awareness of better nutritional practices - building a burning platform for better maternal nutrition



Building Capacity

2nd Premix line at Ambernath, India for Animal Nutrition

Building & Nourishing Lives

Winning a tender for MDM in Odisha in partnership with the World Food Program

Influencing Positively in Fortification standards for Staples - Oil, Rice, Wheat

Building Greener India

Successful commercialisation of “Carbon canister” project helping 2 wheeler OEM’s reduce carbon footprint by reducing evaporative losses.

World’s first test site with DSM Sunshine back sheet(DAS) set up in India for comparative data monitoring. First commercial order of Back sheet from India

DSM India - Beyond Profit - Planet

Planet

Accountability for Performance

- 50% of DEP Electricity consumption is through renewable sources (25% Solar & 25% Wind)
- 100 Kw Roof top solar installed and commissioned at DEP Pune Plant in August 2016.
- Installation of LED lights at all locations - Pune Plant is already transferred to LED lights.

External Orientation

- Participation in Tfs Event- Together for Sustainability attended by 45 Key Suppliers across Bg's
- India Sustainability Team attended CII Sustainability meet and that has given a broad prospective of various initiatives of Government and other organizations in the field of Sustainability.



Inclusion and Diversity

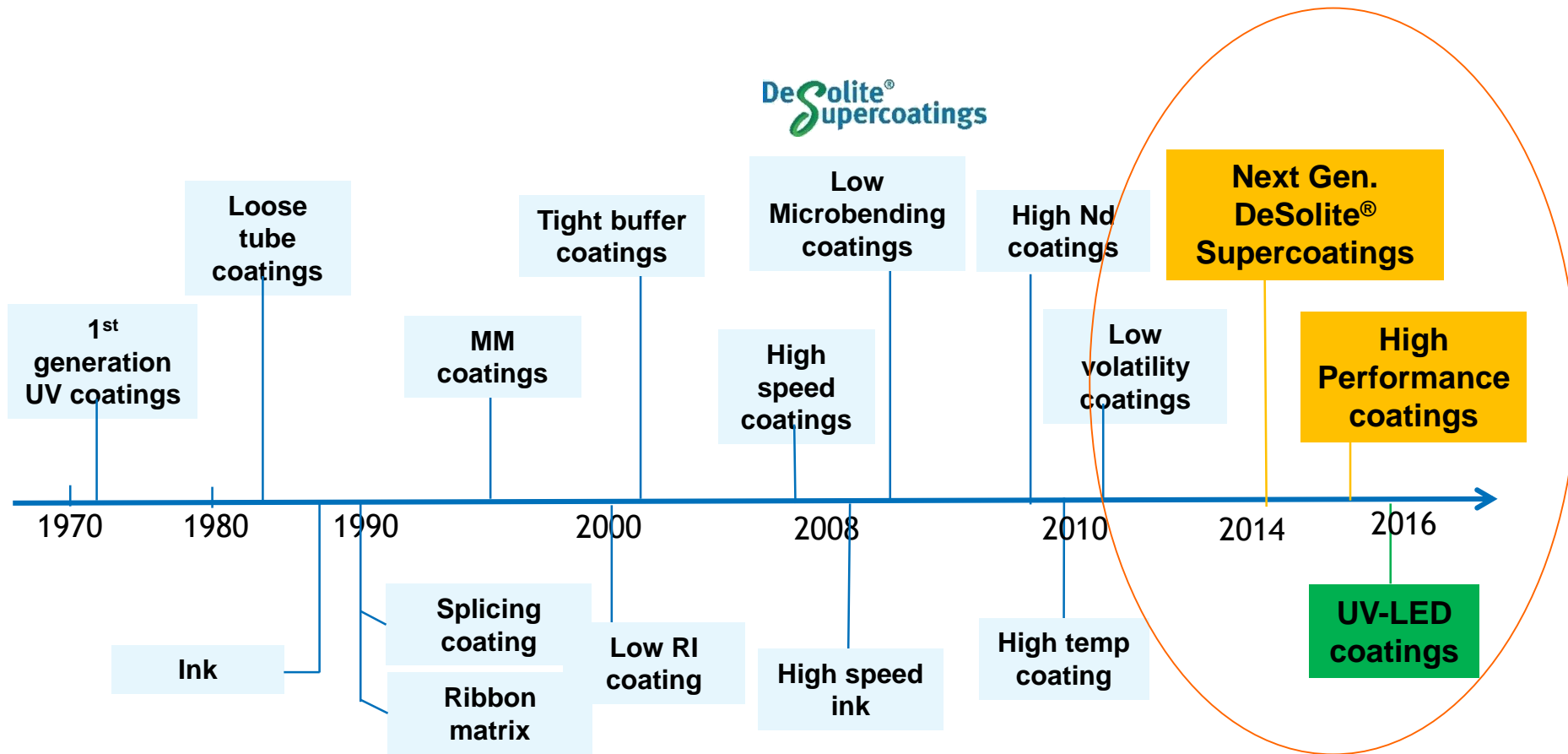
- India Sustainability team with Representations from all BG's (Sites and Offices)
- Capability Building on Sustainability for DSM in India- Accessor course for 2 people in DBS & DEP

Collaboration with Speed

- Project Green Offices implemented at Gurgaon Office and Hyderabad office - extended to DEP-DNP site/Office
- Earth Day was celebrated at all locations
- On 11th Oct 185 employees across India saw the Movie "Before the flood" at the same time which was followed by a discussion with Dimitri - MoB and Regional Presidents.



Innovation is our DNA



Next generation product:

Energy savings, lower Microbending...

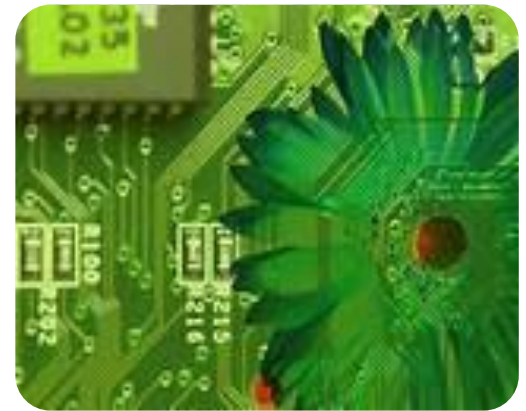
Improve fiber drawing efficiency



High Speed



Low Helium



UV-LED

Increasing fiber drawing speed

- High primary curing speed
- Reached >2800 mpm in 2016

Decreasing Helium consumption



~50% less than previous generation coatings

Novel UV-LED chemistries



- 80% Power saving
- No Mercury used
- No Ozone generation

UV-LED Trials and Results



Evaluations at various draw tower facilities

Nomenclature for different lamp manufacturers

Lamp Manufacturers	Nomenclature
UV-LED Lamp Manufacturer 1	Lamp A
UV-LED Lamp Manufacturer 2	Lamp B
UV-LED Lamp Manufacturer 3	Lamp C
UV-LED Lamp Manufacturer 4	Lamp D
Conventional Microwave Lamp	Lamp MW

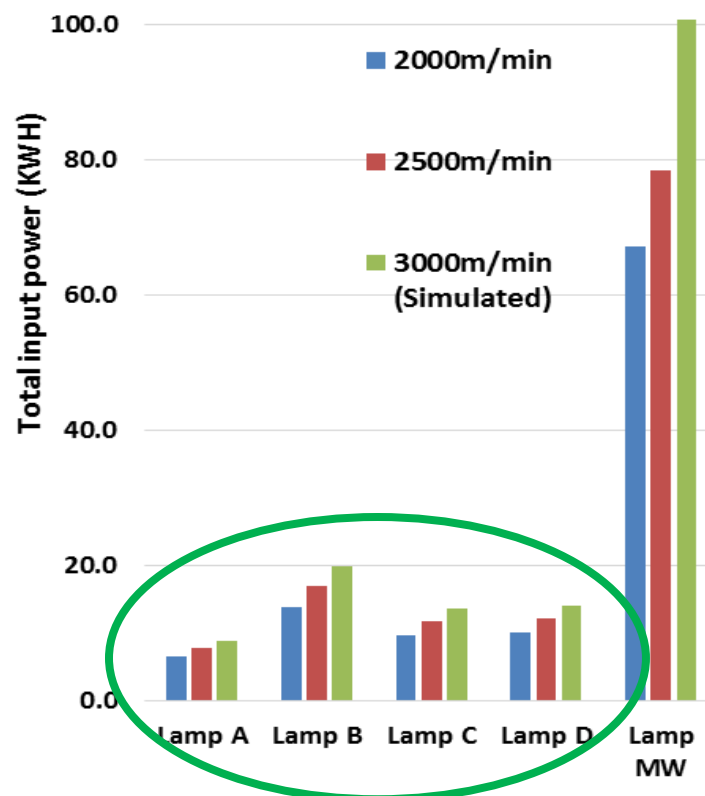


Total input lamp power (KWH) vs. draw speeds with high curing levels

- Over 80% lower than conventional microwave lamps
- Conversion of 20 towers to LED = \$1M per year (average) savings

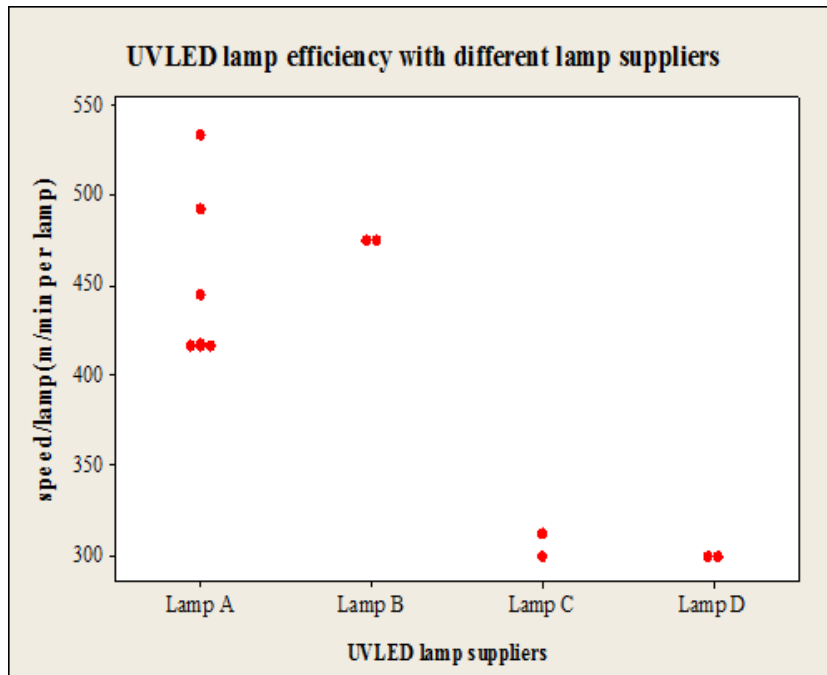


Total input lamp power (KWH)
Vs drawing speeds (mpm)

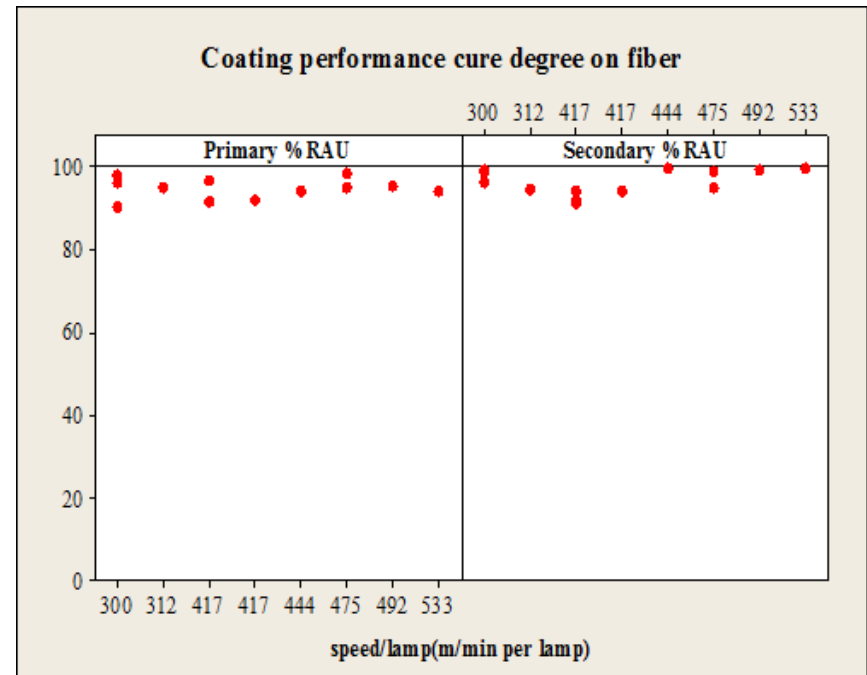


Curing Efficiency

Efficiency of each UV-LED lamp with high curing levels (92-100% RAU)



Primary and Secondary coatings cure performance (%RAU) with different UV-LED lamp manufacturers



Note : %RAU = % Reacted Acrylate Unsaturation

Conclusion of UV-LED Trials

- We have observed that UV-LED lamps can deliver 80+% energy efficiency compared to conventional microwave lamps
- The curing performance and efficiency of commercially available UV-LED lamps depends on coating chemistries, lamp power output (W/cm^2), power intensity, peak wavelength (nm), optics and lens package to deliver maximum output at targeted region
- The fiber optic industry needs to take advantage of these advanced technology chemistries and UV-LED lamps to improve their operational efficiency and enhanced fiber properties package

Q & A





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