



UNDERSTANDING & CONQUERING COLORING CHALLENGES OF SULFONE POLYMERS

AUGUST 4, 2021

SPEAKERS



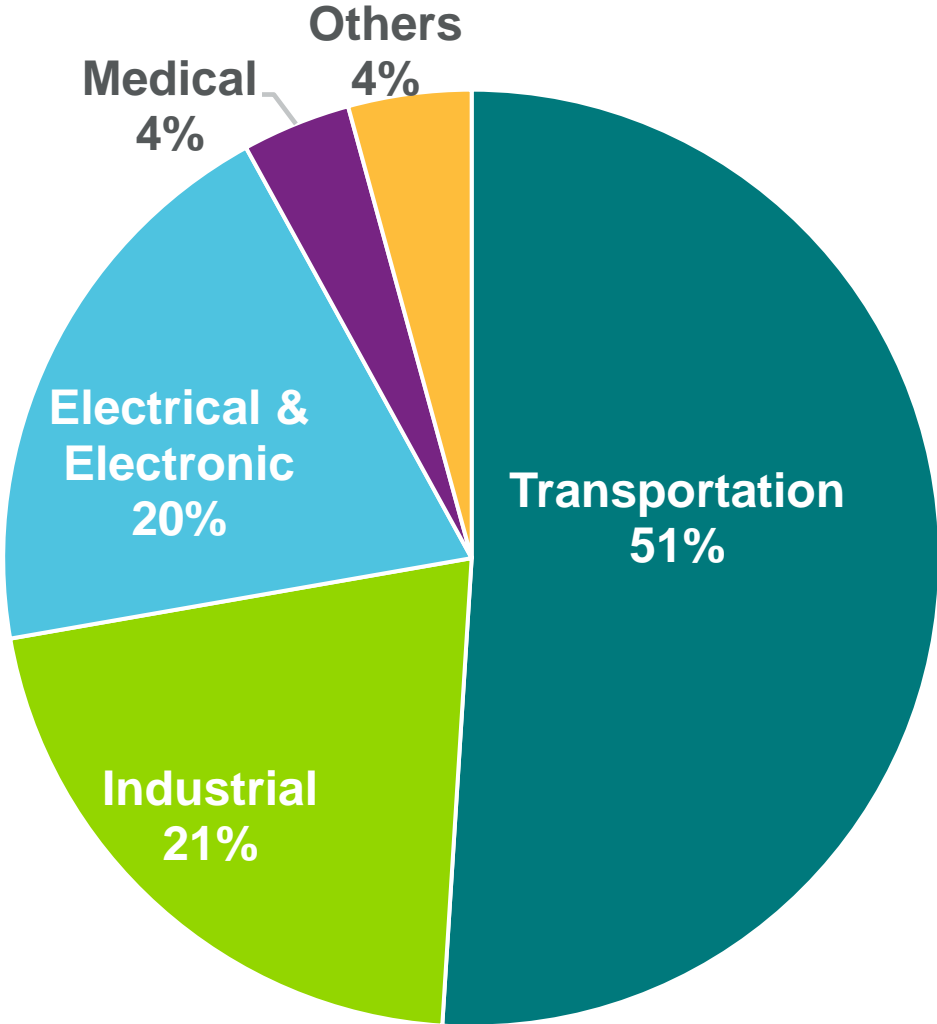
Jamie Ginn Piazza is the regional sales manager, Americas, for Colorant Chromatics™ high performance polymers at Avient Corporation. She is responsible for both the sales and customer service functions supporting the Colorant Chromatics brand of fluoropolymer and high-performance polymer colorant and additive solutions.



Maryline Desseix is the global technology manager for Colorant Chromatics™ high-performance polymers at Avient Corporation. Her leadership centers on building expertise and aligning strategic R&D programs within her global technology team. She has been instrumental in leading a technology team for flame retardant materials, and has also served as global technology director for wire & cable applications.

THE POLYSULFONE GLOBAL MARKET

ANTICIPATED GROWTH AND DEMAND



The global demand for polysulfones in 2023 is estimated to be 80 kilotons

Polysulfones account for approximately 7% of the overall high-performance polymer demand by volume

Other high-performance polymers in the category include fluoropolymers, PEAKs, LCP, PPAs, and more

Polysulfones are expected to grow with a CAGR of 5.0% (2018-2023), with the greatest demand being in transportation

FACTORS DRIVING GROWTH OF POLYSULFONES

MEGA TRENDS



TECHNOLOGY

Increasing demand for polymers to replace metal

HEALTHCARE

Improving longevity and quality of life, requiring advancement in equipment

REGULATORY

Requiring biocompatibility and food safety compliance

MOBILIZATION

Increasing demand for lightweight automotive vehicles and aircraft

SUSTAINABILITY

Providing temperature and chemical resistance to enable reuse compared to traditional polymers

EXAMPLE APPLICATIONS

HEALTHCARE, INFANT CARE, AND COOKWARE



HEALTHCARE
STERILIZATION TRAYS



HEALTHCARE
DENTAL TOOLS



INFANT CARE
BABY BOTTLES



COOKWARE
LIDS

High-temperature resistance, transparency, and clarity are key!

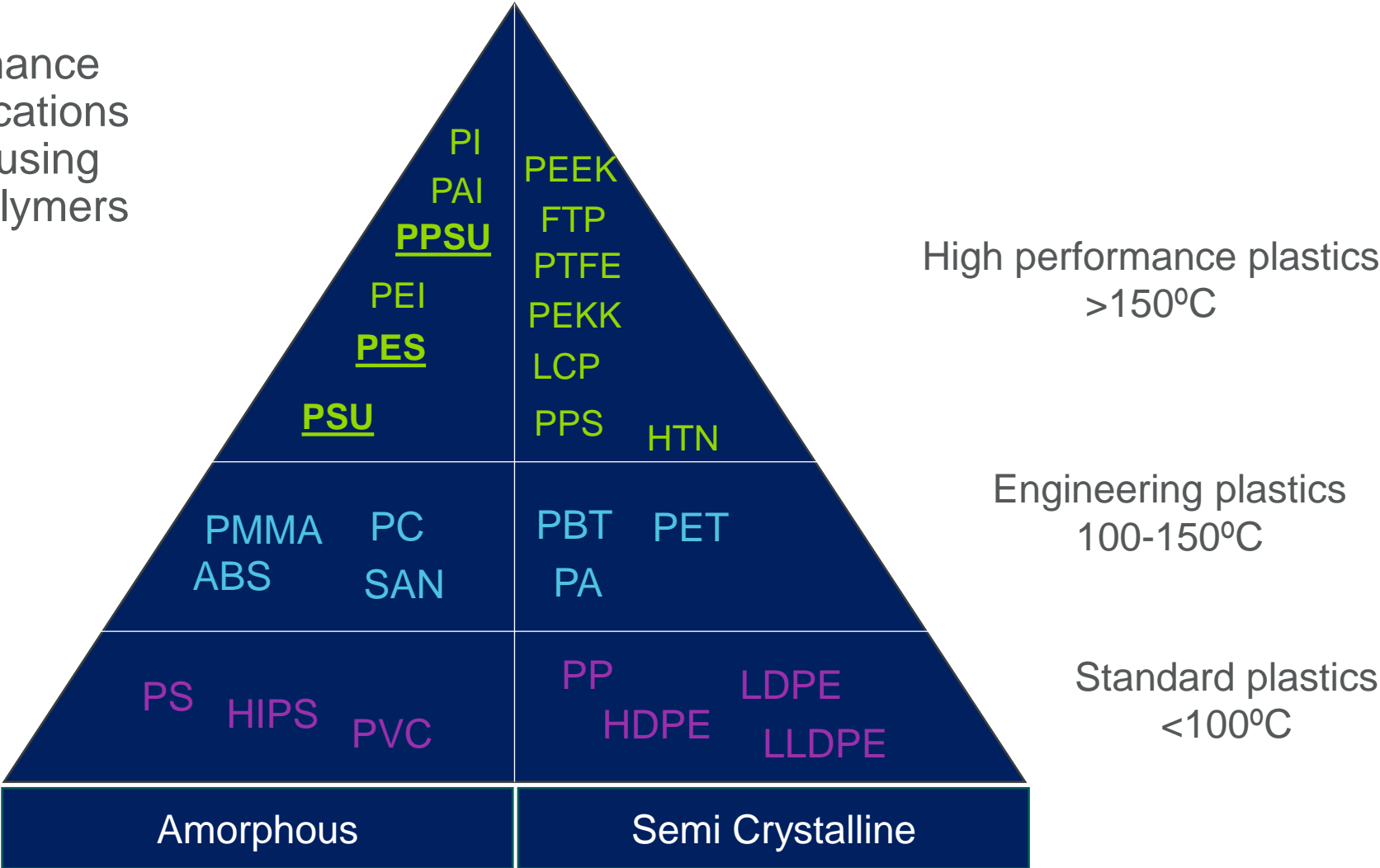
REQUIREMENTS DRIVING THE CHOICE TOWARDS SULFONE POLYMERS

- High Temperature Resistance
- High Chemical Resistance
- Hydrolytic Performance
- Transparency
- Impact Properties
- Low Ignitability

Extended Product Life

INTRODUCTION TO SULFONE POLYMERS

Outstanding performance for specialized applications can be achieved by using high-temperature polymers

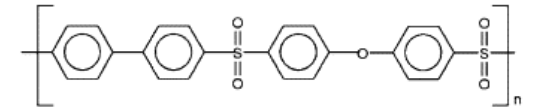


THERMOPLASTIC SULFONE POLYMERS

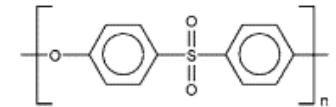
PPSU (polyphenylethersulfone)

PES (polyethersulfone)

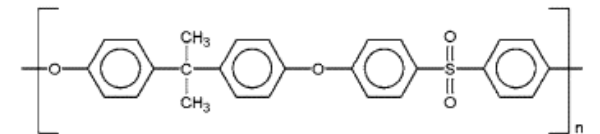
PSU (polysulfone)



PPSU



PES



PSU

PERFORMANCE BEYOND COLOR

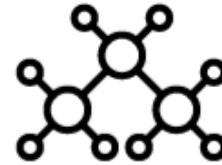
PSU - PES - PPSU



Heat stability



Durability



Chemical stability



Processing



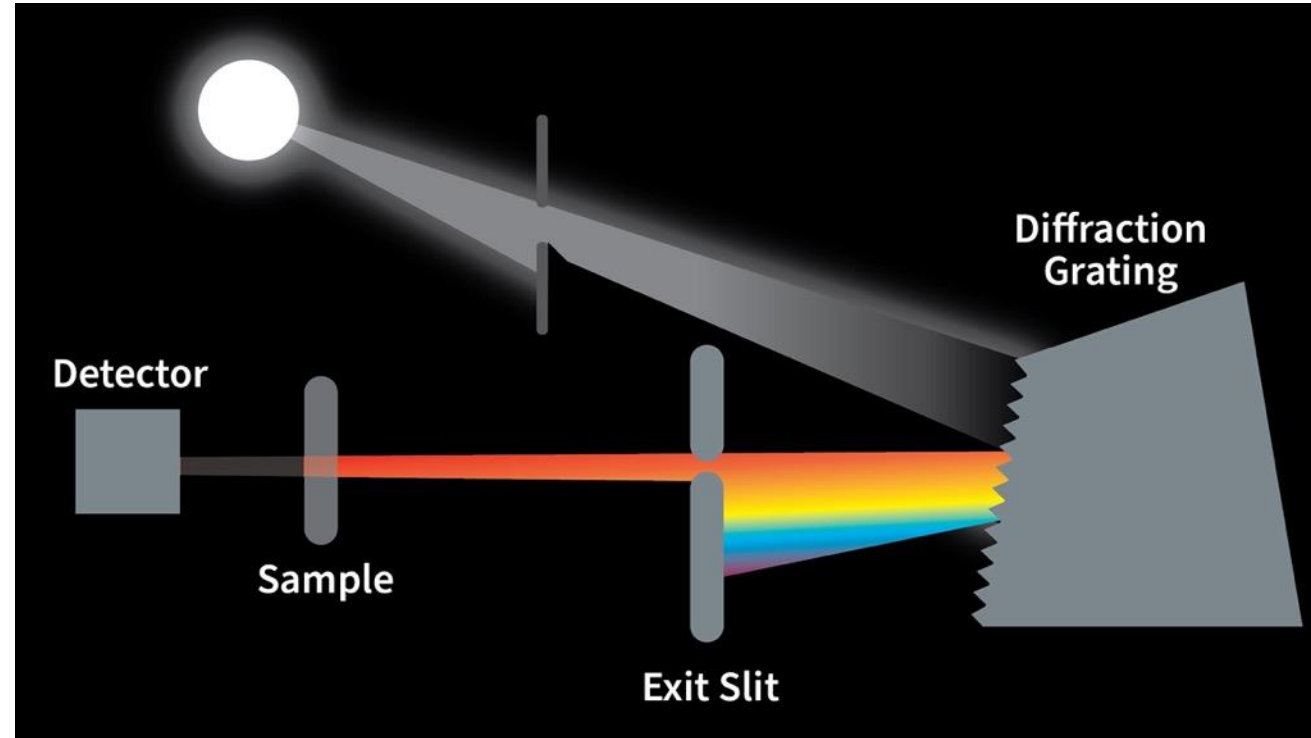
Performance



Aesthetics

INTRODUCTION TO COLOR

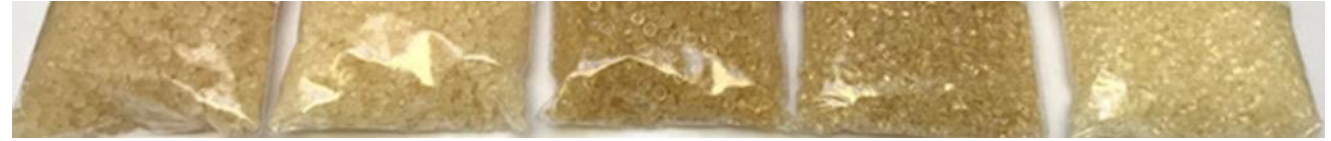
FROM PERCEPTION TO SCIENCE



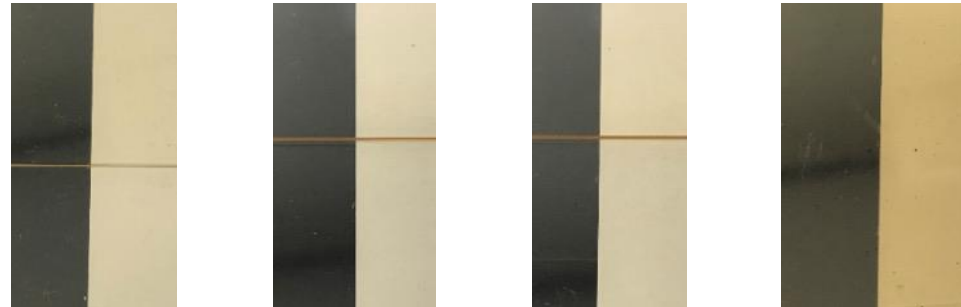
COLORING SULFONE POLYMERS

THE YELLOWING CHALLENGE

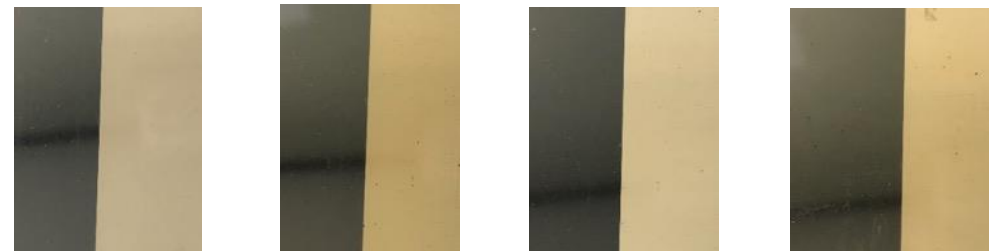
Neat PPSU
Commercial grades
comparison



Neat PPSU
Batch-to-batch variation



Neat PPSU
Thermal history





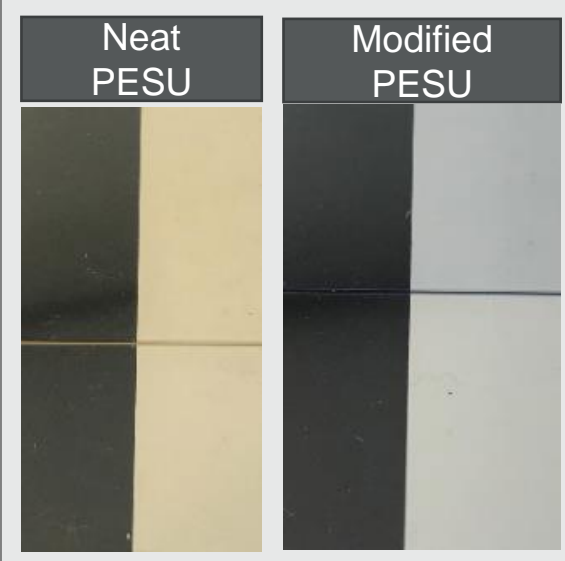
ADDRESSING THE CHALLENGES

Key need is to manage batch-to-batch variation of the yellow index of PPSU/PSU

- Expectations can vary greatly by manufacturer
- More than one solution: blue tint, purple tint, gray tint, blue-gray tint, etc..

Colorant Chromatics™ Precolor or Concentrate solution can be used to cover the natural yellow color of sulfones (primarily PPSU)

- Provides better aesthetics of final part
- During the design stage we can work with you on a number of solutions!



KEY REQUIREMENTS

- Clear, FDA food-contact compliant material that can be run through a dishwasher
- Able to withstand long-term steam and heat
- Allows injection molding of a complex shape with aesthetics that convey cleanliness and quality

AESTHETICS + HEAT RESISTANCE

COOKWARE MANUFACTURER

AIR FRYER WINDOW

AVIENT SOLUTION

Colorant Chromatics™ PESU Concentrate

WHY AVIENT?

- Added concentrate to a natural PES material allowing it to retain clarity and aesthetics in an FDA-compliant solution
- Enabled material to withstand sterilization and maintain continuous heat resistance
- Provided a more pleasing appearance that could command a greater price point due to perception of higher quality

LEARN MORE



COMPLIANCE + HEAT RESISTANCE

BABY BOTTLE MANUFACTURER INFANT MILK BOTTLES

AVIENT SOLUTION

Colorant Chromatics™ PPSU Precolor

WHY AVIENT?

- Developed formulation to comply with both FDA and GB 9685
- Provided material able to withstand repeated steam sterilization and maintain excellent mechanical performance
- Achieved a more pleasing color and clarity to enhance measurement lines
- Met the need for impact resistance

LEARN MORE

KEY REQUIREMENTS

- Compliant with FDA food contact and China National Standard GB 9685
- Able to withstand repeated steam sterilization
- Transparent for more pleasing appearance and easy identification of measurement lines
- Good impact resistance

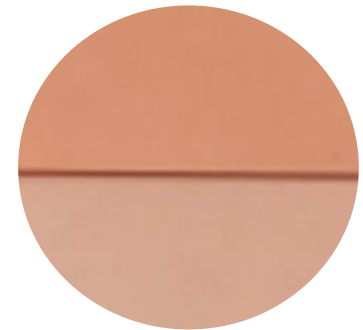
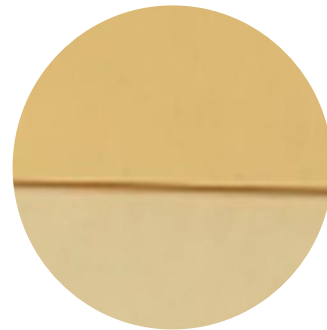
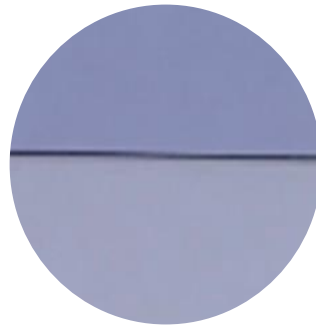
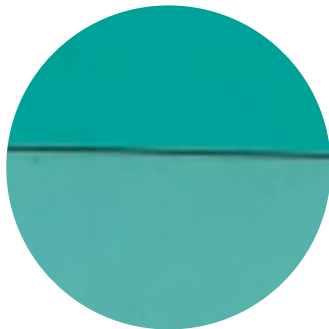
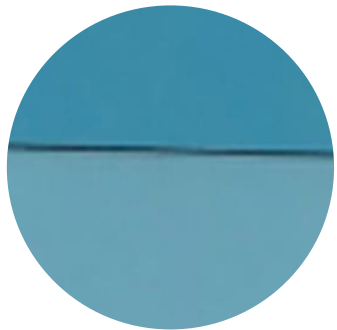
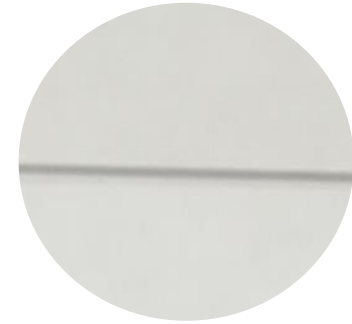
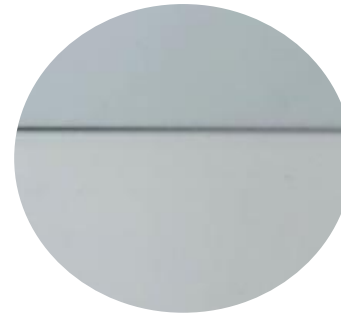
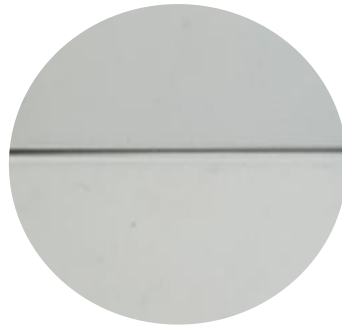
BUILDING ON OUR COLOR CAPABILITIES

BEYOND ANTI-YELLOWING



- Colorant Chromatics™ custom formulations
- Bright, bold or exotic colors
- Clear components in a range of tints
- Clarity in parts up to more than 5mm thick
- Ease of processing and part design
- Food contact and biocompatibility compliance statements

BUILDING ON OUR COLOR CAPABILITIES



INTERNATIONAL COLLABORATION

**Custom
Color**

Bright

**Infinite Tint
Possibilities**

Biocompatible

**Functional
Solutions**

AVIENT

A NEW KIND OF MATERIALS COMPANY

**Deep Customer Relationships
& Application Know-How**

We sell solutions not commodities.

16,000+
CUSTOMERS

**Superior Design Capabilities
& Advanced Analytics**

We iterate fast and often.

>75% of sales
**ARE CUSTOMIZED SOLUTIONS
TO UNIQUE SPECIFICATIONS**

**Global Footprint Strategically
Aligned to Serve Customers**

We produce locally, serve globally.



THE NEW AVIENT

ABOUT US



9,100
employees
worldwide



35,000+
formulations



~\$4 billion
in sales



105
facilities in
30+ countries

*“Imagination is more important than knowledge.
The important thing is to never stop questioning.”
(A. Einstein)*

THANK YOU!

QUESTIONS?

**Jamie Piazza
Avient Corporation
Jamie.Piazza@avient.com**

**Maryline Desseix
Avient Corporation
Maryline.Desseix@avient.com**