Proceedings of the 2019 HPC SPRING MEETING

Friday, April 26, 2019
Montesi Room, Buckman Hall
Christian Brothers University
## 2019 HPC Spring Meeting

**Friday, April 26, 2019**  
Montesi Room, Buckman Hall, Christian Brothers University  
650 East Parkway South, Memphis, TN 38104

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:30 a.m. – 9:00 a.m.</td>
<td>Check-in/Continental Breakfast</td>
</tr>
</tbody>
</table>
| 9:00 a.m. – 9:15 a.m. | **Welcome**  
Siripong Malasri, Healthcare Packaging Consortium Director, CBU                          |
| 9:15 am – 10:30 am  | **Here to There: Collection, Shipping and Storage of Human Biospecimens for Research and Personalized Medicine**  
Jon Wetzel, COO, TriMetis Life Sciences                                                      |
| 10:30 a.m. – 10:45 p.m. | Coffee Break                                                                               |
| 10:45 a.m. – 12:00 noon | **Challenges in Building an Active Cold Chain Packaging Solution for the Retail Supply Chain**  
Steve Scully, Founder/CEO, Thaddeus Medical Systems, Inc.                                      |
| 12:00 noon – 1:30 p.m. | Lunch  
**Recognition of New CPLPs & Presentation of the 2019 Outstanding Packaging Graduate**  
Siripong Malasri, Healthcare Packaging Consortium Director, CBU  
**Announcement of the Gadomski Center for Engineering Innovation (GCEI)**  
Siripong Malasri, Healthcare Packaging Consortium Director, CBU  
**The Gadomski Center for Engineering Innovation: Going Beyond the Maker Space**  
Sean June, GCEI Director, CBU                                                                 |
| 1:30 p.m. – 2:45 p.m. | **A Structured Approach to Creativity Based on the Patent Process**  
Susan Fentress, Managing Director, Veritay Group VG  
Sean June, GCEI Director, CBU                                                                |
| 2:45 p.m. – 3:00 p.m. | Refreshment Break                                                                           |
| 3:00 p.m. – 4:15 p.m. | **Minimizing Legal Risk for Startups**  
Justin Joy, Lawyer, Lewis Thomason                                                             |
| 4:15 p.m. – 5:00 p.m. | **Buckling of Corrugated Fiberboard and Box**  
Siripong Malasri, Deliya Duckworth, Georgina Johns, Kevesha Snow, Jazzmyn Davenport, Alex Moses, Vanessa Cervantes, Alandria Waller, Daniel Gamez, Jade Housewirth, and Yuritza Sanchez, CBU  
**Limits of Temperature and Relative Humidity Combinations in an Environmental Chamber**  
Kevesha Snow and Siripong Malasri, CBU                                                       
**Box Interior Investigation During Drop & Vibration Tests**  
Conrrado Jimenez and Siripong Malasri, CBU                                                  |

Campus Map: [http://www.cbu.edu/assets/2091/cbumap2017.pdf](http://www.cbu.edu/assets/2091/cbumap2017.pdf)

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### Active Members

*Active Members*

*Eetbe, Evergreen Packaging, Fairway Biomed, FedEx, International Paper, Medtronic, Memphis Bioworks, MicroPort Orthopedics, Olympus Surgical Technologies America, Restore Medical Solutions, Smith & Nephew, SweetBio, Thaddeus Medical Systems, Wright Medical*
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Active Members
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## Registered Participants

1. Aflaki, James  
   Christian Brothers University
2. Aguilar, Eduardo  
   Christian Brothers University
3. Baker, Chad  
   Christian Brothers University
4. Bell, James  
   Medical Device Guru LLC
5. Bonner, April  
   Smith & Nephew
6. Brown, Alexander  
   Christian Brothers University
7. Coll, Katu  
   Smith & Nephew
8. Fentress, Susan  
   Veritay Group VG
9. Gamez, Daniel  
   Christian Brothers University
10. Gordy, Carl  
    Christian Brothers University
11. Herwing, Josh  
    Somavac
12. Housewirth, Jade  
    Christian Brothers University
13. Johns, Cameila  
    Bowden Mid-South Gastroenterology
14. Johns, Georgina  
    Christian Brothers University
15. Johns, Philji  
    AT&T
16. Jordan, Brianna  
    Christian Brothers University
17. Joy, Justin  
    Lewis Thomason
18. June, Sean  
    Christian Brothers University
19. Kimble, Erin  
    International Paper
20. Knighton, Benjamin  
    Christian Brothers University
21. Lemmonds, Elizabeth  
    Epicenter
22. Lynch, Cliff  
    Epicenter
23. Malasri, Pong  
    Christian Brothers University
24. Melo Escobedo, Jean  
    Christian Brothers University
25. Moritz, Brad  
    Thaddeus Medical Systems
26. Parker, James  
    Christian Brothers University
27. Podesta, Thomas  
    Christian Brothers University
28. Pourhashemi, Ali  
    Christian Brothers University
29. Ray, Asit  
    Christian Brothers University
30. Samaniego-Mata, Cesar  
    Christian Brothers University
31. Scully, Steve  
    Thaddeus Medical Systems
32. Snow, Kevesha  
    Christian Brothers University
33. Stevens, Ryne  
    Smith & Nephew
34. Tabor, Zachery  
    Christian Brothers University
35. Tull, Ben  
    FedEx Services
36. Valverde Toledo, Guillermo  
    Christian Brothers University
37. Ventura, John  
    Christian Brothers University
38. Waddell, Taylor  
    Christian Brothers University
39. Wellford, Brandon  
    Memphis Bioworks
40. Wetzel, Jon  
    TriMetis Life Sciences

### Active Members

Bayer Consumer Care, Eetbe, Evergreen Packaging, FedEx, GlaxoSmithKline, International Paper, Medtronic, Memphis Bioworks, MicroPort Orthopedics, Olympus Surgical Technologies America, Smith & Nephew, SweetBio, Thaddeus Medical Systems, The Pallet Factory, Wright Medical
Here to There: Collection, Shipping and Storage of Human Biospecimens for Research and Personalized Medicine

Jon Wetzel¹

Abstract: In the world of personalized medicine a tumor excised from a cancer patient is unique and irreplaceable, so how are we going to make sure it arrives safely? You might find it surprising but there is no standard for the physical collection of human biospecimens for research yet there is currently estimated to be over 1 billion samples in storage all around the world. We are going to dive into the world of biospecimens and how the old models for sample collection, packaging and shipping need to be updated because the new world of personalized medicine is going to require samples get to their final destinations, intact and viable every time.

Keywords: Biospecimens; Personalized medicine

Presenter: Jon Wetzel – Jon Wetzel is COO of TriMetis Life Sciences and has 26 years of expertise in the life sciences and 18 years of management experience in startup biotech in CLIA, CAP, ISO and GXP environments. He is a Lean Six Sigma Black Belt and his particular field of expertise is in cold chain logistics and human biospecimen procurement around the globe.

¹ TriMetis Life Sciences, 20 S. Dudley, Suite 900, Memphis, TN 38103. jwetzel@trimetisls.com
Challenges in Building an Active Cold Chain Packaging Solution for the Retail Supply Chain

Steve Scully

Abstract: Advances in technology are improving many aspects of our lives, yet we still can’t reliably deliver expensive biological therapies to patients’ homes without the risk of spoilage due to temperature excursions. Why is the cold supply chain stuck in the old practice of using disposable Styrofoam and plastic ice packs to protect life-saving therapies? Cheap disposable packaging will not be sustainable over the next few years as increased scrutiny, regulation, and customer demand will begin to pressure companies to adopt reusable sustainable solutions that work better to control and track temperature for sensitive and expensive therapies. Patients deserve the best quality medicine that can be delivered to their doorstep, and temperature tracking that they can verify. Larger companies that form our cold chain need to start breaking the addiction to Styrofoam and adopt reusable small solutions to make these deliveries.

Founded in late 2014, Thaddeus Medical Systems (Thaddeus) has undergone a gauntlet of challenges so that we can put our technology to better use in solving the weakest link of the cold chain: packaging. As expensive biological therapies become more common, consumers will demand the adoption of our smart, reusable, active cold-chain packaging solution. Where many previous companies have failed at creating a small, active, reusable cold chain package, we will be the first to market our product, the iQ-ler, to bring the cold supply chain out of the disposable and plastic ice-age!

Keywords: Active shipping container; Active solution; Cold chain, Sustainability

Presenter:

Steve Scully, MD, PhD - Dr. Scully obtained his BS in Biochemistry from Boston College, continued post-baccalaureate studies at MIT, and pursed his Medical degree at the University of College, Dublin, Ireland. Dr. Scully was an intern at The Cleveland Clinic and then completed his Doctorate in Molecular and Cellular Biology at the University of Massachusetts, Amherst. He subsequently was recruited to Mayo Clinic where he was an NIH Fellow in Pharmacogenomics and Autoimmune Neurology. He founded Thaddeus Medical Systems in 2014 to eradicate pre-analytical issues in Clinical Pathology (where the majority of all medical testing errors occur). Through creative engineering and the integration of multiple technologies, Thaddeus Medical Systems first product, the iQ-ler, will improve diagnostic accuracy and treatment outcomes for patients, and aims to ameliorate the diagnostic and therapeutic industries through better packaging technology.

1 Thaddeus Medical Systems, Inc., 3605 US Highway 52 North, Building 103, Rochester, MN 55901.
Steve@thaddeusmed.com
Certified Packaging Lab Technician (CPLP Level I)

Alexander Brown
Benjamin Knighton
Carl Gordy
Cesar Samaniego-Mata
Jean Melo Escobarde
Kyle Nicholson
Zachery Tabor
Guillermo Valverde Toledo
Taylor Waddell

Certified Packaging Lab Technologist (CPLP Level II)

Jade Housewirth
Georgina Johns

Congratulations!
Georgina Johns is a B.S. in Engineering Management major with Packaging Concentration and Business Administration Minor. She is currently an intern with a packaging group at Smith & Nephew (S&N) and will roll into a full-time position at the company immediately after her graduation this May. Before her internship with S&N, she interned with NuVasive and FedEx Packaging Lab. Georgina has been involved in various packaging R&D projects, as well as some ISTA test projects at CBU Packaging Lab. She is an ISTA Certified Packaging Lab Technologist and has authored/coauthored 13 publications.

Georgina was Vice President for CBU TAPPI Student Chapter. She has been very active with the Society of Women Engineers (SWE) Student Chapter by serving as its Fundraising and Workshop Chair, Vice President, and President (current).

Congratulations
The Gadomski Center for Engineering Innovation: Going Beyond the Maker Space

M. Sean June

Abstract: Maker Spaces have become a fixture in STEM education. Their popularity and ubiquity is a testament to their value. They fill a need for small building skills that are lacking in most incoming students, as well as encouraging a different kind of creative process often referred to as “thinking with your hands”. Our student-run Engineering Innovation Center will bring resources, and opportunity for all students to engage more fully in the creative process and develop entrepreneurial pursuits while generating revenue.

Keywords: Innovation; Maker space; Entrepreneurship

Presenter:
M. Sean June – Dr. June is an associate professor in the Mechanical Engineering Department and Director of the Gadomski Center for Engineering Innovation. Dr. June has taught at the university level as an adjunct or full-time professor for 21-years, and was with IBM for 13 of those years. At IBM Dr. June’s specialty was cooling solutions and thermal interface materials for I, P, and Z-series servers as well as Intel-based servers and PCs.
A Structured Approach to Creativity Based on the Patent Process

Susan Fentress¹ and M. Sean June²

Abstract: The relationship between creativity and science is not well understood, and not easily defined. We seem to have a sense that the arts compliment the creative process in science and engineering, but have a difficult time seeing how the same creative process that goes into a painting would be useful to an engineer. For an engineer, creativity with a purpose is an immediate need. The patent process encourages this creativity with a purpose, and a structured thought process through three simple questions. These questions are; “What is the problem being solved?” “How have others solved this problem?” and “What is your invention and how does it solve the problem?” The patent process does not require proof that it will actually work, and therefore encourages thinking that is unrestricted by the thought of failure.

Keywords: Creativity; Patent; Invention

Presenter:

Susan Fentress, Esq. – Susan Fentress practices in the areas of intellectual property and biosciences. In particular, she has extensive experience in the preparation and prosecution of chemical and biotechnical patent applications, as well as medical diagnostics, medical imaging agents, food technologies, agricultural products, disposable medical and personal devices, and natural and veterinarian products. In addition, she is knowledgeable on FDA and transactional issues related to generic drugs, and she has experience in international and U.S. regulatory issues related to design, production and distribution of medical devices.

M. Sean June, Ph.D – Dr. June is an associate professor in the Mechanical Engineering Department and Director of the Gadomski Center for Engineering Innovation. Dr. June has taught at the university level as an adjunct or full-time professor for 21-years, and was with IBM for 13 of those years. At IBM Dr. June’s specialty was cooling solutions and thermal interface materials for I, P, and Z-series servers as well as Intel-based servers and PCs.

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² Gadomski School of Engineering, Christian Brothers University, 650 E. Parkway S., Memphis, TN 38014. mjune@cbu.edu
Minimizing Legal Risk for Startups

Justin Joy¹

Abstract: Among the myriad of challenges facing startups, legal considerations are too often given secondary priority. In many instances, addressing and mitigating legal risk proactively provides considerably more value to a company than expending resources reacting to claims and other disputes that often arise in the absence of any meaningful planning or risk management. As an initial step in minimizing legal risk, new and emerging companies must first recognize the numerous areas where legal problems and liability may arise. This presentation will cover a range of areas and issues where legal risk may arise in startups and provide some strategies for addressing that risk. Areas that will be covered include employment-related liability, corporate constituent duties, and data security and privacy concerns.

Keywords: Legal risk; Startups

Presenter:

Justin Joy - Justin Joy is a shareholder based in the Memphis office of the law firm Lewis, Thomason, King, Krieg & Waldrop, P.C. Justin is a Certified Information Privacy Professional/US (CIPP/US) and a Certified Information Privacy Technologist (CIPT) through the International Association of Privacy Professionals and currently serves as Lewis Thomason’s chief privacy officer. In addition to a range of experience in information privacy, cybersecurity and healthcare matters, Justin has a variety of experience in various civil litigation matters including, business and commercial litigation, insurance coverage disputes, and business torts. Justin also represents departing individuals, as well as employers and closely held corporate entities, in business separation and dissolution matters. He also has experience in advising small and midsize private corporations and businesses in various areas. He is a member of the American, Tennessee, and Memphis Bar Associations. Justin earned his B.S. degree from Wake Forest University and his M.B.A. and J.D. degrees from the University of Memphis.

¹ Lewis Thomason, One Commerce Square, 29th Floor, 40 South Main, Memphis, TN 38103. jjoy@lewisthomason.com
Buckling of Corrugated Fiberboard and Box

Siripong Malasri, Deliya Duckworth, Georgina Johns, Kevesha Snow, Jazzmyn Davenport, Alex Moses, Vanessa Cervantes, Alandria Waller, Daniel Gamez, Jade Housewirth, and Yuritza Sanchez

Abstract: A group of students studied buckling of corrugated fiberboard and boxes. They have found the following results:

- The compression strength of a 2-in width corrugated strip at 73°F / 50% RH reduced by about 65% from the unsupported length from 2” to 12”.
- The compression strength of a 2-in width corrugated strip at 73°F / 90% at RH reduced by about 82% from the unsupported length from 2” to 12”.
- The compression strength of a 2-in width corrugated strip reduced about 41% from 73°F / 50% RH to 73°F / 90% RH.
- The compression strength of a 5”x5”x12” C-flute single-wall RSC corrugated box at 73°F / 50% RH reduced about 8.5% from an unsupported length from 3” to 12”.

As expected, the slenderer a fiberboard strip or a box is, the weaker it becomes. Also, the strength of fiberboard strip decreases with higher relative humidity.

Keywords: Corrugated fiberboard; Corrugated boxes; Buckling; Humidity effect

Presenters:
Siripong Malasri – Dr. Malasri is Dean of Engineering and Healthcare Packaging Consortium Director at Christian Brothers University. He is a registered professional engineer in the State of Tennessee and an ISTP Certified Packaging Laboratory Professional (Professional Level).

Deliya Duckworth, Georgina Johns, Kevesha Snow, Jazzmyn Davenport, Alex Moses, Vanessa Cervantes, Alandria Waller, Daniel Gamez, Jade Housewirth, and Yuritza Sanchez – All are B.S. in Engineering Management majors with Packaging Concentration and Business Administration Minor. All are ISTA Certified Packaging Lab Technicians.

1 Gadomski School of Engineering, Christian Brothers University, 650 East Parkway South, Memphis, TN 38104, USA. pong@cbu.edu
Limits of Temperature and Relative Humidity Combinations in an Environmental Chamber

Kevesha Snow and Siripong Malasri

Abstract: A student studied the combinations of temperature and relative humidity (RH) of the CSZ ZP-32 environmental chamber at the CBU ISTA Certified Packaging Laboratory. A graph showing a range of RH for a given temperature was developed with the following findings:

• The chamber could not reach any RH when the temperature was set below 38°F.
• The chamber could reach an upper limit of about 95% RH when the temperature was set above 38°F.
• The lower limit of RH, “y” in %, followed the equation below, where “x” was the temperature in °F.

\[ y = 289.66e^{-0.028x} \]

The graph was then attached to the front side of the chamber door.

Keywords: Environmental Chamber; Temperature and humidity combination

Presenters:

Kevesha Snow – Kevesha is an B.S. in Engineering Management major with Packaging Concentration and Business Administration Minor. She is an ISTP Certified Packaging Laboratory Professional (Technician Level) and currently interns with FedEx Packaging Lab.

Siripong Malasri – Dr. Malasri is Dean of Engineering and Healthcare Packaging Consortium Director at Christian Brothers University. He is a registered professional engineer in the State of Tennessee and an ISTP Certified Packaging Laboratory Professional (Professional Level)
Box Interior Investigation During Drop & Vibration Tests

Conrrado Jimenez and Siripong Malasri

Abstract: A portable video borescope with flexible endoscope with camera and LED light was used to monitor box interior during drop and vibration tests. It was inserted into a box containing some test objects. The quality of video captured was acceptable. Seeing movements inside a box during a vibration or drop test could reveal some packaging problems. In a real application, an extra packaged product would be provided by a lab customer. This extra box would be opened to determine best locations to insert cameras for video capturing. Each endoscope has only one channel. Captured videos and/or still snapshots can be saved in the unit. These files can then be uploaded to a computer. Multiple endoscopes can be used to observe activities at various locations with potential problems.

Keywords: Environmental Chamber; Temperature and humidity combination

Presenters:

Conrrado Jimenez – Conrado is an B.S. in Engineering Management major with Packaging Concentration and Business Administration Minor. He is an ISTP Certified Packaging Laboratory Professional (Technician Level) and operates his own smart phone/computer repair shop.

Siripong Malasri – Dr. Malasri is Dean of Engineering and Healthcare Packaging Consortium Director at Christian Brothers University. He is a registered professional engineer in the State of Tennessee and an ISTP Certified Packaging Laboratory Professional (Professional Level)

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1 Gadomski School of Engineering, Christian Brothers University, 650 East Parkway South, Memphis, TN 38104, USA. pong@cbu.edu
CBU Session

Introduction

Buckling of Corrugated Fiberboard and Box

Limits of Temperature and Relative Humidity Combinations in an Environmental Chamber

Box Interior Investigation During Drop & Vibration Tests

2019 HPC Spring Meeting
Friday, April 26, 2019
Christian Brothers University

Introduction

BSEM (Packaging Concentration): Key courses

Required
- PKG 101 Intro to Pkg (1 cr)
- PKG 202 Packaging Lab (2 crs)
- PKG 315 Pkg Materials (3 crs)
- PKG 319 Principles of Pkg (3 crs)
- PKG 321 Healthcare Pkg (3 crs)
- PKG 411 Pkg Design (3crs)
- PKG 490 Pkg Projects (2 crs)
- PKG 489 Prof Certification (0 cr)
- PKG 495 Pkg Internship (3 crs)

Electives (16 crs of engineering, science, packaging, business courses)
- PKG 302 Pkg Lab Instrumentation (1 cr)
- PKG 488 IoPP CPIT (3 crs)
Required

- CHEM 115/L Chemistry (4 crs)
- MATH 131 Calculus I (3 crs)
- PHYS 150/L Physics I (4 crs)
- ART 314/L Digital Imaging (3 crs)
- ENGR 101 Prin of Engrg (3 crs)
- ME 121 Solid Modeling (3 crs)
- ME 201 Manufacturing (3 crs)
- ACCT 260 Financial Acct (3 crs)
- BLAW 301 Bus Law (3 crs)
- ECON 214 Microeconomics (3 crs)
- FIN 327 Finance (3 crs)
- MGMT 227 Management (3 crs)
- MGMT 418 Supply Chain (3 crs)
- MKTG 311 Marketing (3 crs)
- STAT 221 Bus Statistics (3 crs)

Communication Skills

- ENG 111 Eng Comp I (3 crs)
- ENG 112 Eng Comp II (3 crs)
- ENG 371 Business Writing (3 crs)
- SPCH 125 Speech (3 crs)

Optional Safety Training

Course Topics

- Orientation
- Introduction to OSHA
- Walking and Working Surfaces
- Exit Routes
- Emergency Action Plans
- Fire Prevention Plans
- Electrical Safety
- Personal Protective Equipment (PPE)
- Hazard Communication
- Hazardous Materials
- Materials Handling
- Machine Guarding
- Safety and Health Programs
- Ergonomics
- Leading Cultural Change
Buckling of Corrugated Fiberboard and Box
S. Malasri, D. Duckworth, G. Johns, K. Snow, J. Davenport, A. Moses, V. Cerantes, A. Waller, D. Gamez, J. Housewirth, and Y. Sanchez

Typical Column Buckling Curve

- 200-lb C-flute single-wall strips
  - 5 each
    - 2"X6.5" to 2"X15.5" with 0.5" increment in length

Conditioning
- 73F / 50% RH
- 73F / 90% RH

Compression Test
### Table 1. Compression Strength of Corrugated Strips at 73°F / 50% RH

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<th>Specimen Length (in)</th>
<th>Unsupported Length (in)</th>
<th>$P_{1}$ (lb/2-inch width)</th>
<th>$P_{2}$ (lb/2-inch width)</th>
<th>$P_{3}$ (lb/2-inch width)</th>
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<th>$P_{max}$ (lb/in)</th>
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### Table 2. Compression Strength of Corrugated Strips at 73°F / 90% RH

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Table 3. Compression Strength of Corrugated Strips Based on Trendline Equations

<table>
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<th>$P_{\text{max}}$ (lb/in)</th>
<th>Difference (%)</th>
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<tr>
<td>Change from 2&quot; to 12&quot; (%)</td>
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<tr>
<td>Average Difference (%)</td>
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C-flute single-wall RSC Boxes

- 5”x5”x12”
- 5 each
  - Approximate unsupported lengths of 12”, 6”, 4”, 3”

Conditioning
- 73°F / 50% RH

Compression Test

Table 4. Compression Strength of 5”x5”x12” Corrugated Box at 73°F / 90% RH with Different Unsupported Heights

<table>
<thead>
<tr>
<th>Approx. Unsupported Height (in)</th>
<th>Pmax (lb)</th>
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<tr>
<td></td>
<td>P1</td>
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<tr>
<td>4</td>
<td>382</td>
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<tr>
<td>6</td>
<td>357</td>
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<tr>
<td>12</td>
<td>322</td>
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Limits of Temperature and Relative Humidity Combinations in an Environmental Chamber
K. Snow and S. Malasri

Figure 1. Possible Combinations of Temperature and Relative Humidity of Typical Environmental Chambers [2]
Figure 2. CSZ Temperature & Humidity Chamber Model ZP-32

Table 1. Upper and Lower Limits of Relative Humidity at Different Temperature for CSZ ZP-32

<table>
<thead>
<tr>
<th>Temp (F)</th>
<th>Chamber RH Limits (%)</th>
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Figure 2. CSZ Temperature & Humidity Chamber Model ZP-32

Figure 3. Upper and Lower Limits of Relative Humidity at Different Temperature for CSZ ZP-32
Box Interior Investigation During Drop & Vibration Tests
C. Jimenez and S. Malasri

Hti@XT Portable Video Borescope, Flexible Endoscope w/Inspection Camera & Light, Waterproof, 3.5 Inch Video Screen, 3 Mega Pixels Resolution, Low Light Camera, 4 x Zoom, 8.5 mm Probe w/ 6 LEDs(10 FT)
Captured Still Pictures

Captured Video of Drop Test
Captured Video of Vibration Test