Contamination Control in Cleanrooms Best Practices at JPL

Presented by:

Taguhi Arakelian

Jet Propulsion Laboratory/Caltech

taguhi.arakelian@jpl.nasa.gov

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Jet Propulsion Laboratory

- Has over 100 cleanrooms
- Varies from ISO 1 to ISO 8.5

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Contamination Control in Cleanrooms

Some are for research

Others are for spacecraft and instrument assembly

Making uniform Contamination Control (CC) requirements complex and difficult

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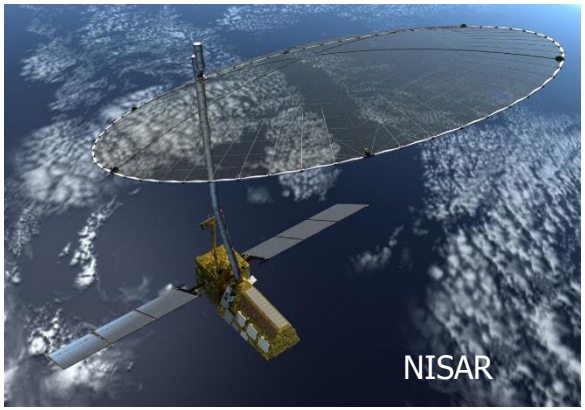
Contamination Control in Cleanrooms

Some spacecraft slated to study the Earth



Others will explore bodies that have the possibility of harboring alien life

With varying CC requirements, and additional Planetary Protection (PP) requirements for some

Contamination Control in Cleanrooms at JPL

Technical Facilities Management (TFM)

- Team of scientists, engineers, technicians and administrative staff
- Provide cleanroom cleaning, certification, garment service, disposable garments (shoe covers, gloves, etc.), new cleanroom design and construction consulting to Facilities, and more
- Collaborate with process CC engineers, PP scientists, missions and cleanroom managers and users

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Contamination Control in Cleanrooms

Training and expertise

- TFM:
  - ISO 14644, IEST RP's, ASTM
  - Frequency
- PP:
  - Biological contamination control
- JPL cleanroom managers, users
  - Cleanroom Fundamentals
  - Electrostatic discharge (ESD)

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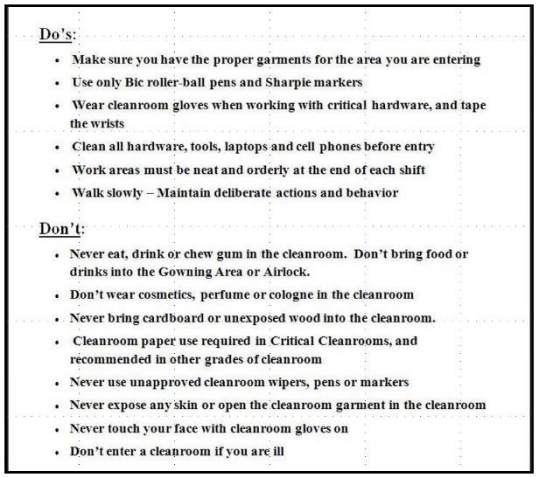
Contamination Control in Cleanrooms

"We are in this together"

- Training includes protocols for users
  - Know who to ask
  - Is a given material ok in the cleanroom?
  - Teaming



Do's:

- Make sure you have the proper garments for the area you are entering
- Use only Bic roller-ball pens and Sharpie markers
- Wear cleanroom gloves when working with critical hardware, and tape the wrists
- Clean all hardware, tools, laptops and cell phones before entry
- Work areas must be neat and orderly at the end of each shift
- Walk slowly – Maintain deliberate actions and behavior

Don't:

- Never eat, drink or chew gum in the cleanroom. Don't bring food or drinks into the Gowning Area or Airlock.
- Don't wear cosmetics, perfume or cologne in the cleanroom
- Never bring cardboard or unexposed wood into the cleanroom.
- Cleanroom paper use required in Critical Cleanrooms, and recommended in other grades of cleanroom
- Never use unapproved cleanroom wipers, pens or markers
- Never expose any skin or open the cleanroom garment in the cleanroom
- Never touch your face with cleanroom gloves on
- Don't enter a cleanroom if you are ill

In-class training is complete,

now what?

- Allowed items
  - Poster, list or pictorial
  - Lockers, hangers, etc.
- Commonly discouraged activities
  - Poster, list or pictorial

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Contamination Control in Cleanrooms

Cleanroom set-up

- Gowning room:
  - Shoe cleaners
  - Tack-mats
  - Defined dirty and clean sides
  - Gowning & de-gowning instructions
  - Cleaning supplies for small items
- Airlock
  - Defined dirty and clean sides
  - Cleaning supplies
- Air shower
  - Number of people allowed

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Contamination Control in Cleanrooms

Cleanroom monitoring

- Certification
  - Cleanrooms
  - Cleanroom HEPA vacuum cleaners
  - Frequency
- Remote continuous airborne particulate, temperature and relative humidity monitoring
  - Reduced frequency of certification
  - Reporting to customers

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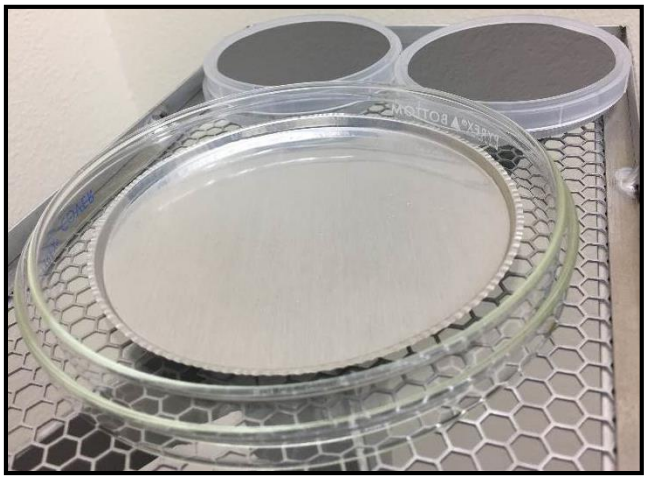
Contamination Control in Cleanrooms



Cleanroom monitoring (continued)

- Witness plates
  - Particulate
  - Organic
- Walk through's
  - Quarterly
  - Check on housekeeping

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Contamination Control in Cleanrooms

HEPA Filters

- Evaluated
  - Frequency
- Tracking air velocity through the filters
  - Frequency

Contamination Control in Cleanrooms

Challenges

- ESD materials and contamination control in cleanrooms
  - Always searching for materials that particulate and outgas less
  - This increases cost, sometimes to unacceptable levels
- Relative humidity control
  - Not all air handlers can keep up with Southern California warm and dry days

Contamination Control in Cleanrooms

Questions?

Thank you

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