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# Calibration and Maintenance of Gas Detection Systems



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Providing Solutions to Detect, Measure, Analyze, and Control Your Process and Your Facility.

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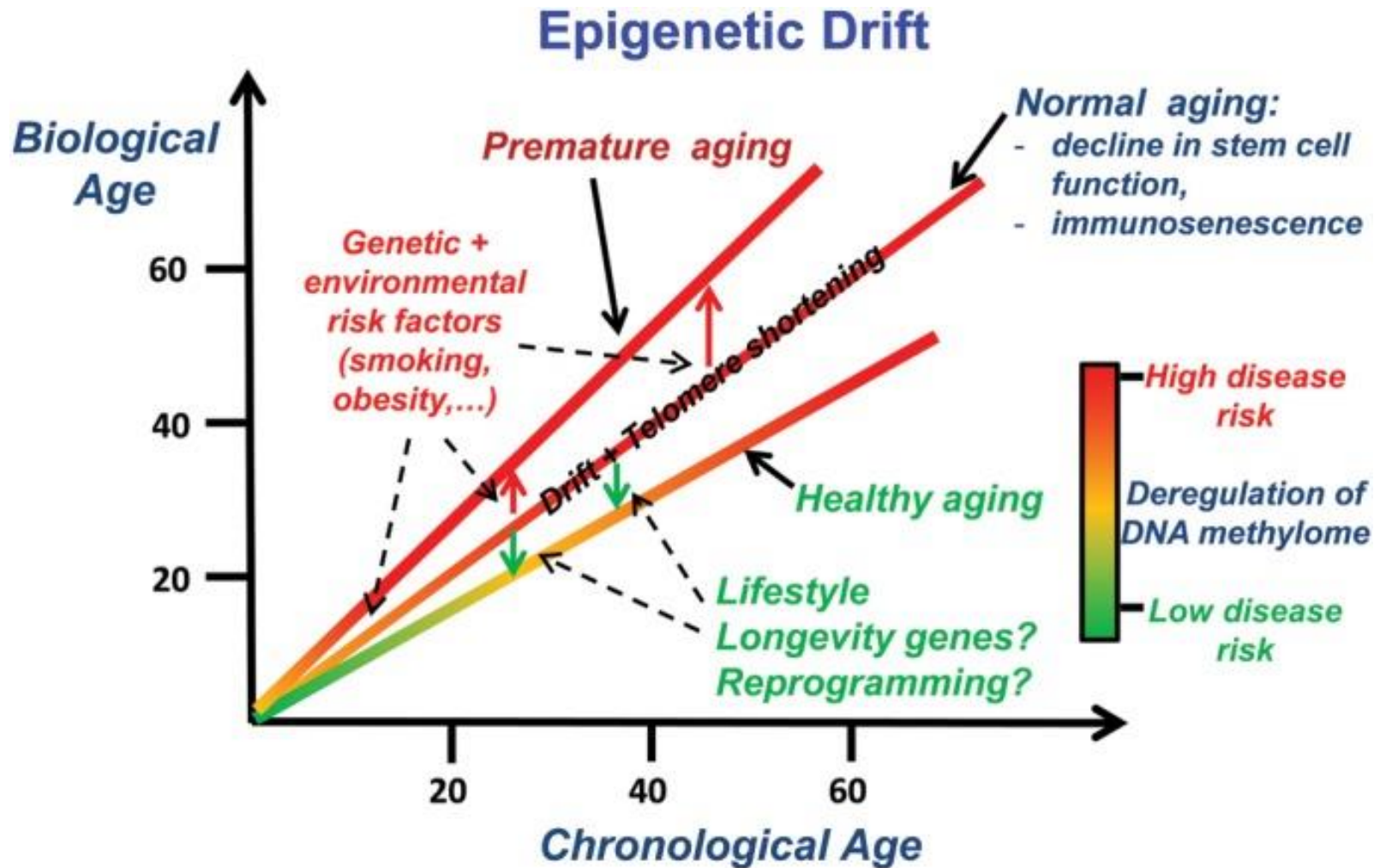
## On the Hook



- “We, the manufacturer, suggest a calibration interval of at least every 6 months – never longer than a year...”
- Fine print: “but at the end of the day, its your safety system and you have to decide on a safe calibration interval...”
- “itsum u faultus ifin something badus happenus”



# Everything Drifts



- **Bump check:** application of a known standard to a device and verification that the reading is within tolerance
- **Calibration:** adjustment of a measuring device to match a known standard
- **System check:** check performance? What does that mean...? Does it mean bump check and calibrate if out of tolerance? Or does it mean functional test where you calibrate the sensors and then do a full system check where gas is applied at the end device and the alarm functions are all confirmed?

## Bump check

- I applied Xppm of gas type Y (lot number 1234) and reading came to Xppm +/- our tolerance. I can confidently say that the detector is still in place and responds within spec...as of this moment in time.
- I cannot say that that the alarm system responds as expected without further testing

## Calibration

- I applied zero air to the system and adjusted the output to read zero. Next, I applied X ppm of gas type Y (lot number 1234) and adjusted the output to read X.
- I cannot say that the alarm system responds as expected without further testing...

## Performance check

- Take the cause/effect matrix and test the entire system.
- If the purple light in the hallway is supposed to light up if sensor 2 or 3 gets to the first alarm level, trip sensor 2 then 3 and confirm you see a purple light. If security is supposed to get a signal, confirm they get the signal...and respond as expected.



## Example 1

- Process engineer complemented me on the stability of my catalytic bead LEL sensor, then showed me the historian plot – steady zero for weeks and weeks. The process had intermittent releases of combustible gas – no way it should be steady zero for weeks so we went out and put eyes on the detector. It was completely coated in a waxy material – there was no way for gas to reach the sensing element.
- Bump or calibration would have identified.

## Example 2

- Customer had an oven “pop” but no LEL alarm had gone off in advance. Went to the site and bump checked the detector and it was working well. After significant additional digging, discovered that the alarm output that was feeding the oven controller had been disconnected by an operator who was paid on throughput (didn’t like the nuisance of the alarm indications)...
- Only a function or performance check would have uncovered this.

## Example 3

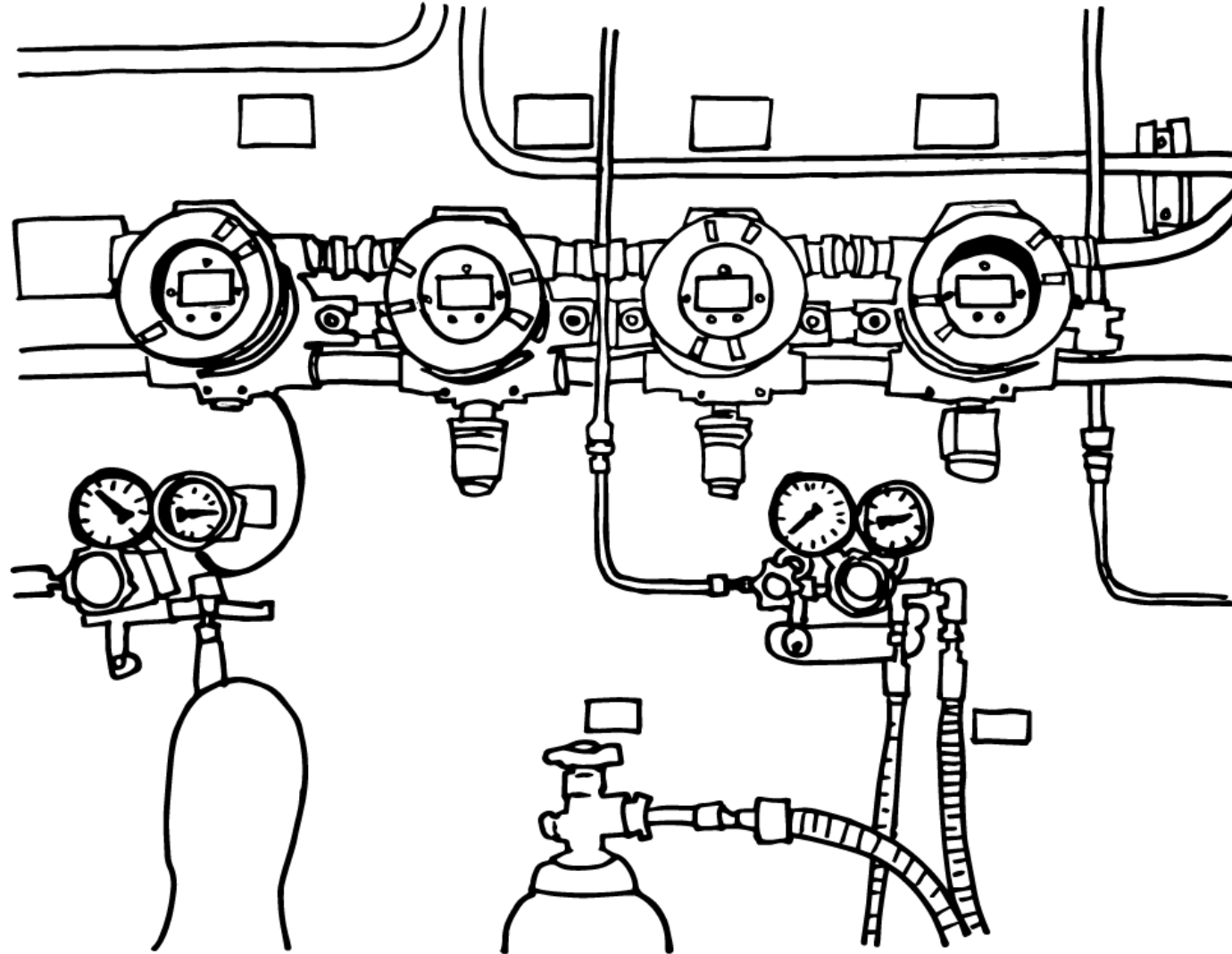
- Walking a customer site and noticed a red beacon light in the production bay of a paint and coatings facility. When I asked what was driving that alarm light, I got 3 different answers from the 3 different people I was with –
- Only a function/performance check with employee re-training would correct this.

## Example 4

- Customer indicated that a sensor wasn't reading correctly – sensor was displaying 7ppm and customer was certain there was no gas in the area. Applied zero gas and the instrument read 0 – applied span gas and the sensor was on target. Sensor climbed back up to reading 6ppm in ambient air. Quote from employee nearby “see, I told you that thing wasn't working...” further investigation determined a cross interfering gas was in the area.
- Bump check/calibration and employee training fixed the problem

## The Real Questions To Ask

- Do you trust the detection system?
- Do your employees behave exactly as you want in response to an alarm event?





## Do You Trust Your System?

- If yes, keep it up!
- If no, we need to dig a bit deeper
  - What is the issue?
    - Alarm didn't go off when it should have
    - Alarm goes off for “no” reason
    - The sensor is reading 7 but I “know” the air is clean...
    - *I don't know what to do when the alarm goes off*
  - **Build your calibration and maintenance scope of work and interval based on these answers...**

- No matter what the sensor technology selected, stuff happens...sensors drift, lightbulbs burn out, people leave or get reassigned to other work...
  - When you put the system in, there was a plan that if x happened, then people would do this or that...
  - These specific behaviors are the real end product of the detection system
- The “quantum duplex foresight algorithm” technology in the detectors help, but the most common issue we run across is not the sensor being out of spec, but that the employees don’t know what to do in the case of an alarm...

- Set a reasonable frequency for sensor calibration
  - Factor the risk of sensor failure and your experience with the sensors in your application
  - Keep in mind that the older the sensor, the quicker the decline...
  - Check sensors after high gas exposure
- Set a separate frequency for system testing
  - Test your expectations:
    - Do the lights light?
    - Do the horns horn?
    - **Do your people behave correctly?**

# THANK YOU!



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