

# Vision for the Technology and Product

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CPFD Software

# Overview

- Where We Are Today
  - 17.0
  - The Need for Speed
- Where We're Going
  - 17.1 Preview
  - Roadmap Overview
    - Roadmap in Detail
  - After 17.1
  - Survey Results
  - Understanding The Product
  - Dream Big



# Where We Are Today: 17.0

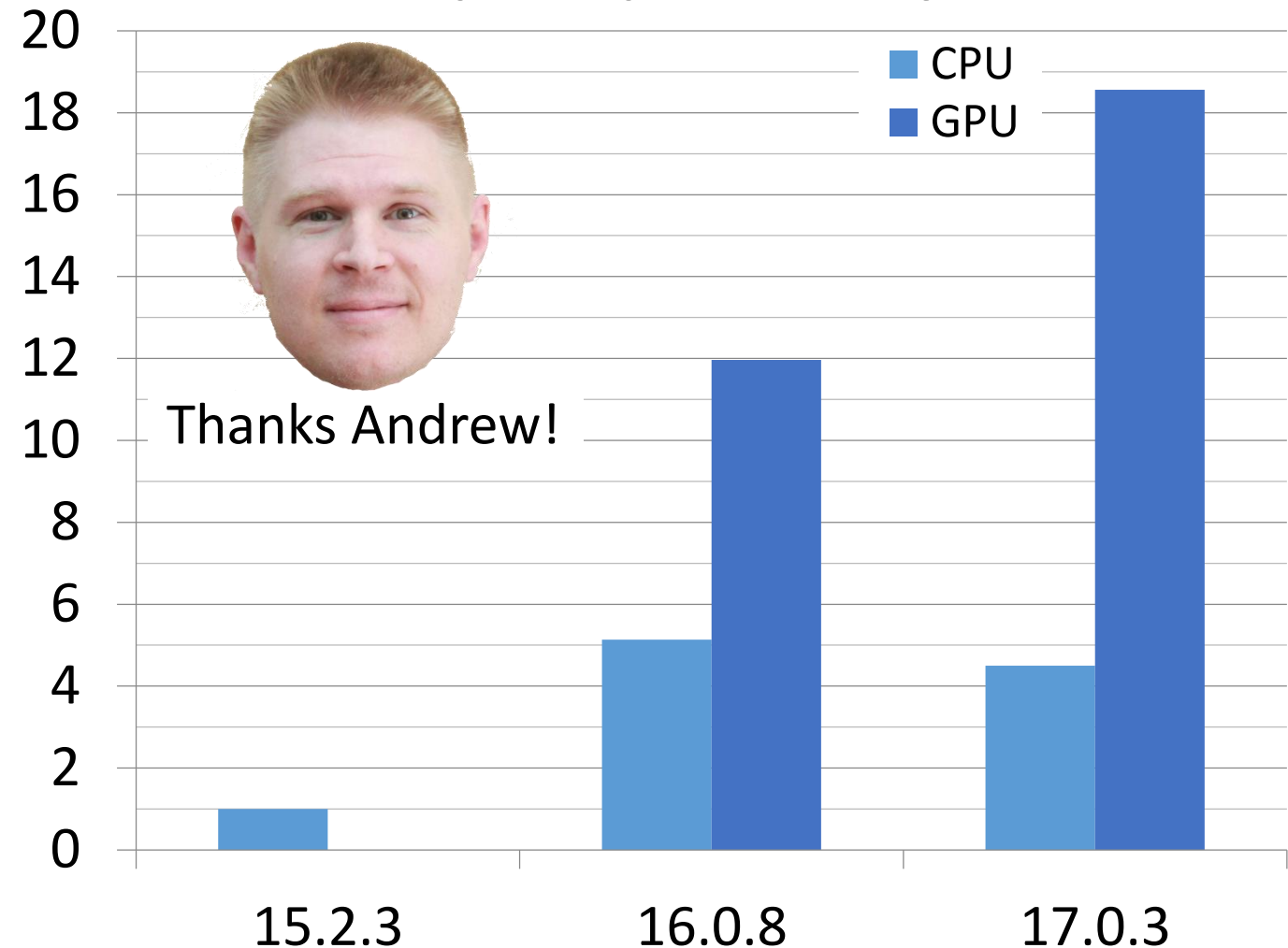
- BC Connections
- Baffles
- Drag multiplier tables
- GPU speed increased further
- Improved Chemistry models
- Grid Generator improved
- Interface usability
- And others

BVR Version	Release Date
16.0.8	March 6, 2015
17.0.0	April 29, 2015
17.0.1	June 3, 2015
17.0.2	July 16, 2015
17.0.3	September 3, 2015

# Where We Are Today: The Need for Speed

- Wednesday Gasifier made bigger
  - Cells: 259,176
  - Particles: 2,549,755
- Ran on same machine
- 2 years in November since 15.2.3
- 17.0.3 CPU slower?!
- Hardware upgrades last 7 years, ~3x
- More speed with larger project

Normalized Speed-up Wednesday Gasifier



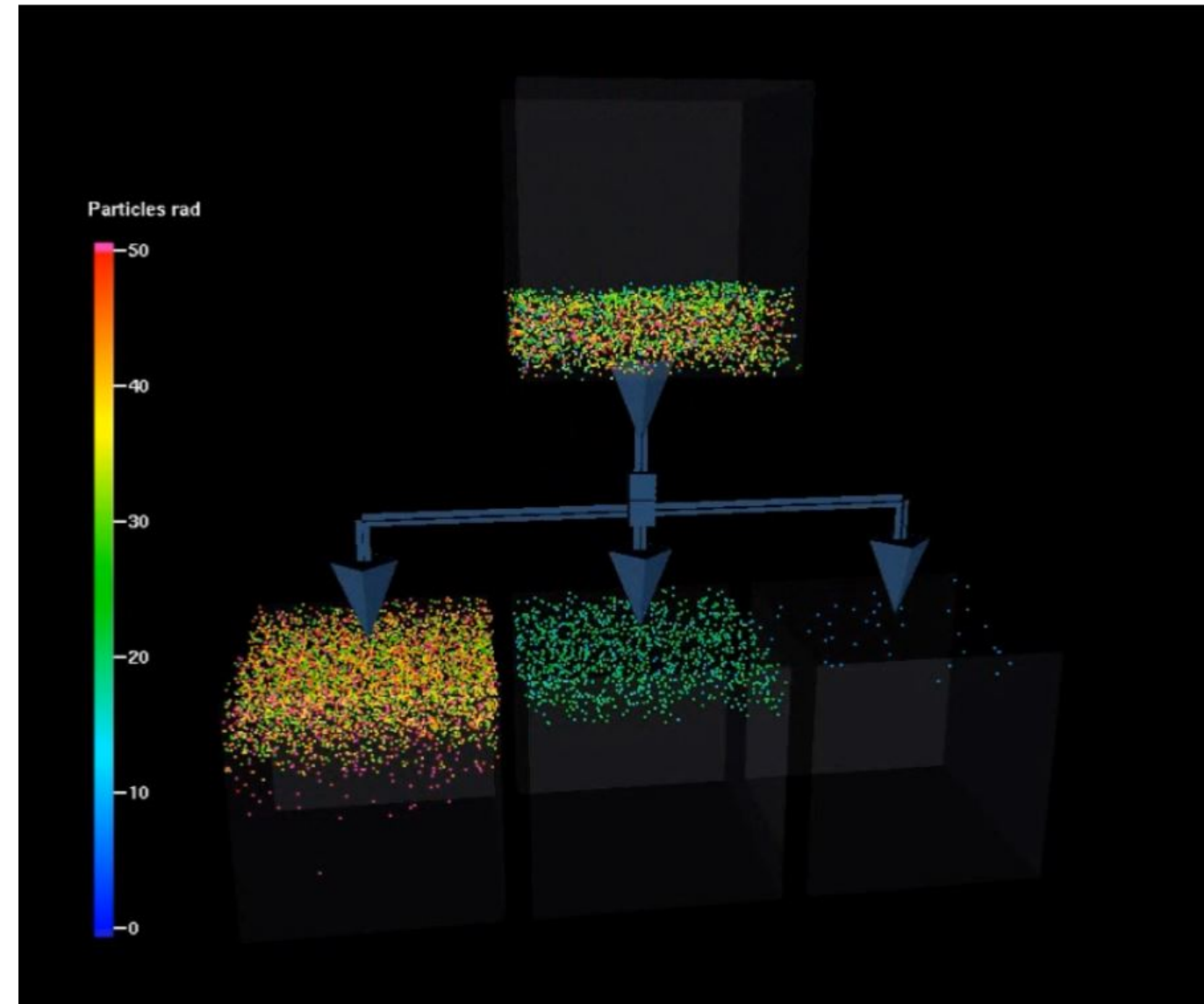
# Where We're Going: 17.1 Preview

- **BC Connection Filter Tables**
- **Real Gas for materials**
- **Collision Models: Equilibrium and Isotropy**
- **Evaporation**
- **Particle Resolution Distribution**
- **Random Particle Initialization**
- Improved model options
- More output options
- Grid Generation Improved Accuracy
- Transient Lumped Resistance



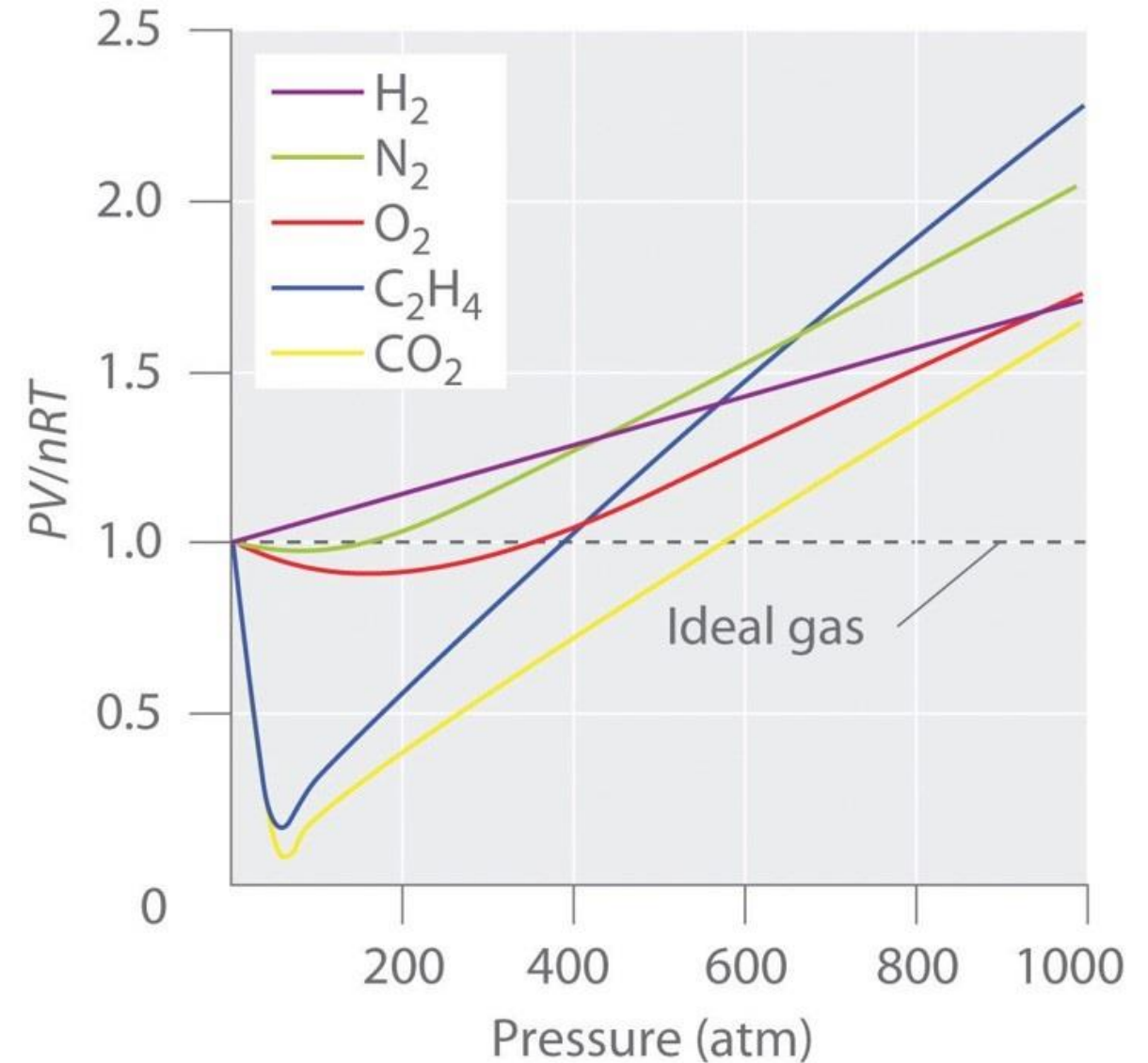
# 17.1 Preview: BC Connection Filter Tables

- What are Filter Tables?
  - Fluid filtering
  - Particle filtering
- Why do they matter?
  - Example: Cyclones in a regenerator
- Better results, easier, faster



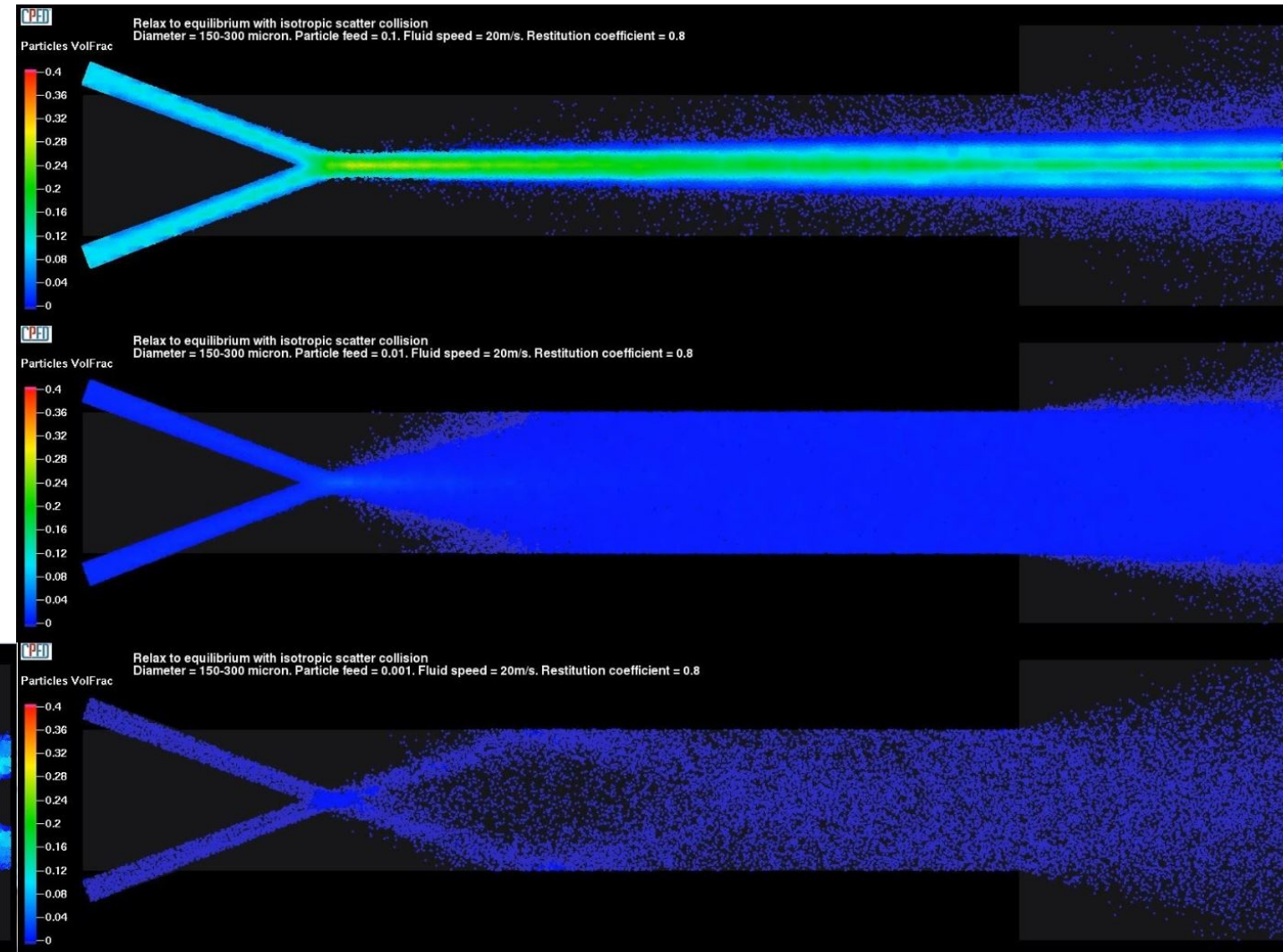
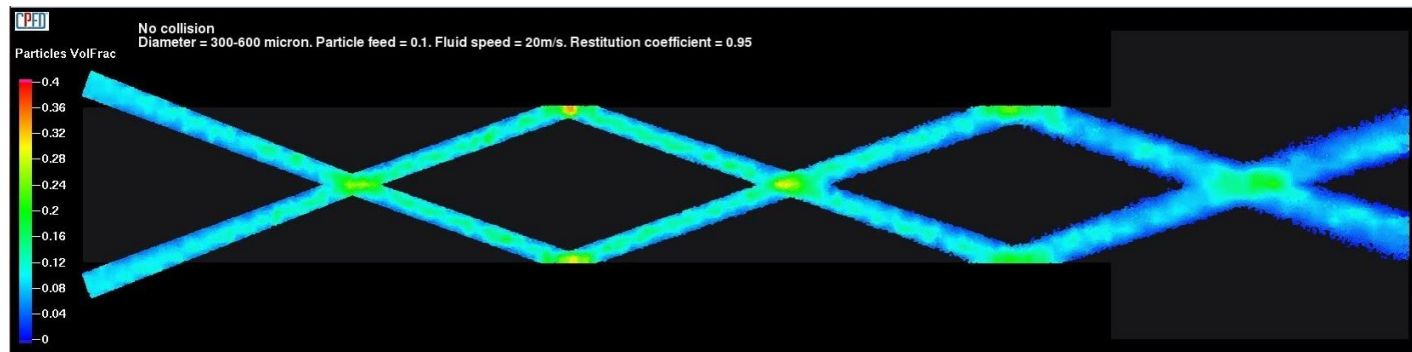
# 17.1 Preview: Real Gas

- For conditions where the ideal gas law becomes inaccurate, for example:
  - High pressure
  - Low temperature
  - Near critical point



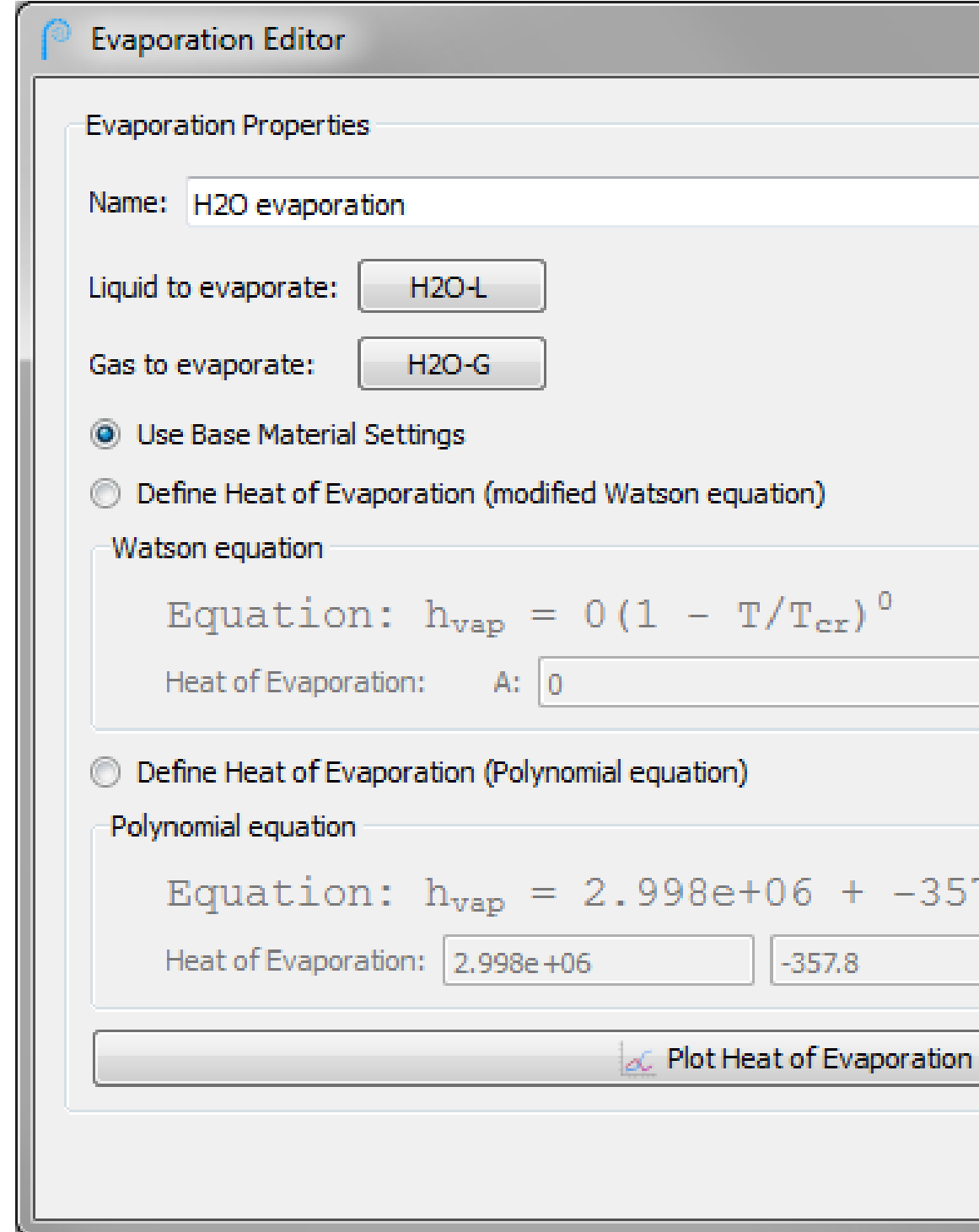
# 17.1 Preview: Collision Models

- Improving collision models by considering two effects of collisions
  - Equilibrium
  - Isotropy
- Better results by modeling more particle interaction



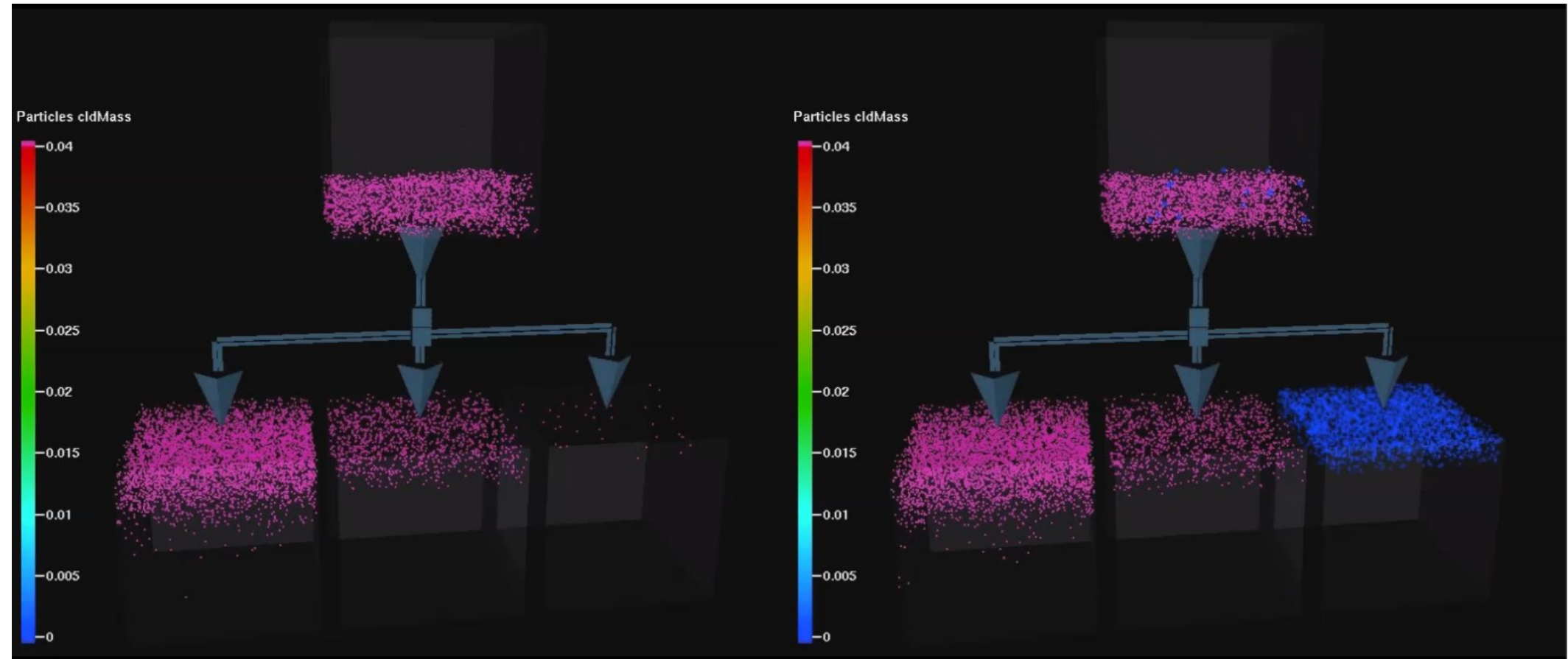
# 17.1 Preview: Evaporation

- To simulate evaporation of droplets and liquids on surface of solid particles
- Evaporation parameters specified 3 ways:
  - Added to material properties
  - Defined Watson equation
  - Defined Polynomial equation



# 17.1 Preview: Particle Resolution Distribution

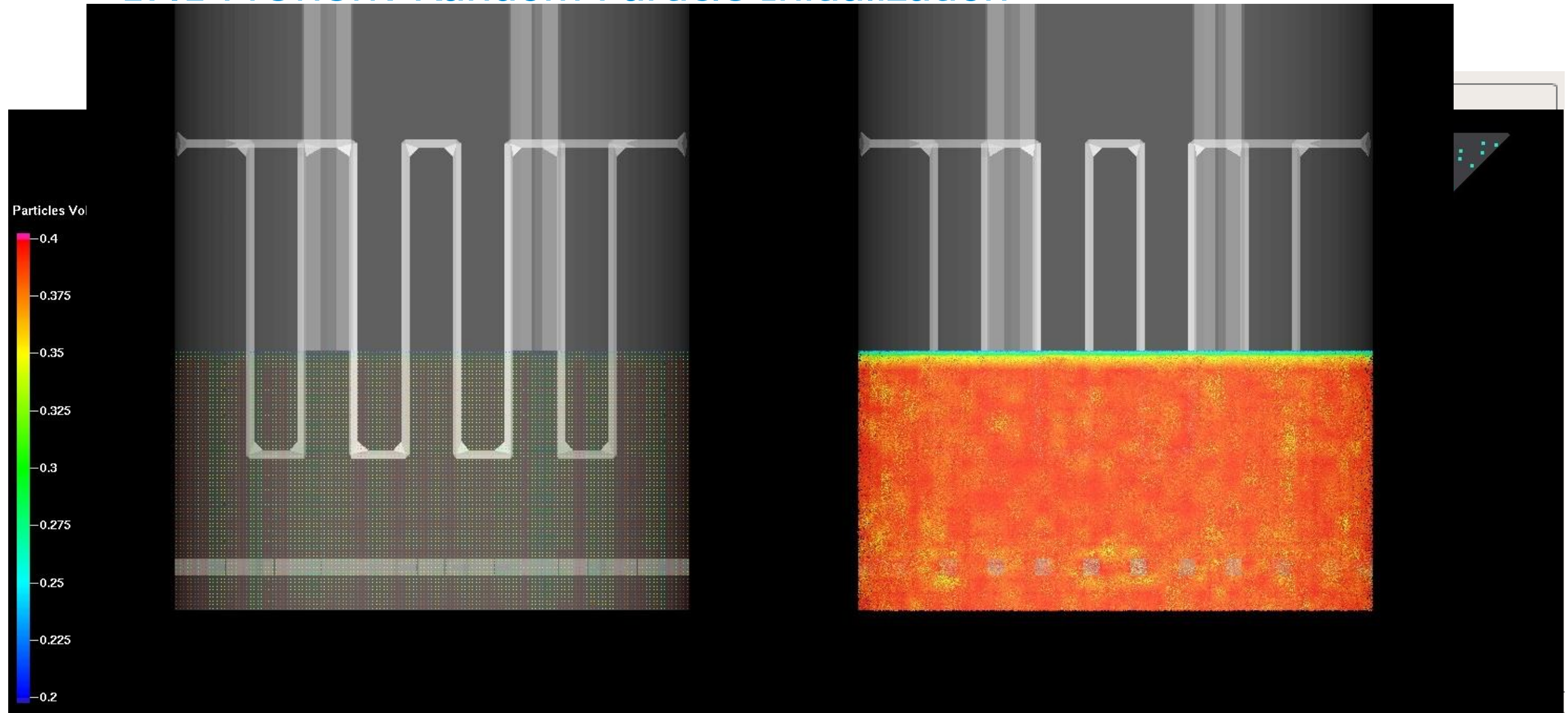
- Increase resolution where you need it
- Same mass, more computational particles



Baseline

Increased resolution of fines

# 17.1 Preview: Random Particle Initialization



# Where We're Going: Roadmap Overview

Consistent Great Results

Intelligent Inputs

Intelligent Analysis

Intelligent Parametrics

Dream Big

# Roadmap in Detail: Consistent Great Results

- Good in = Good out
- Improved numerics
- Improved chemistry
- Gridding
- Performance
- Usability enhancements
- More user defined parsing/functions
- Restart improvements
- More modeling applications



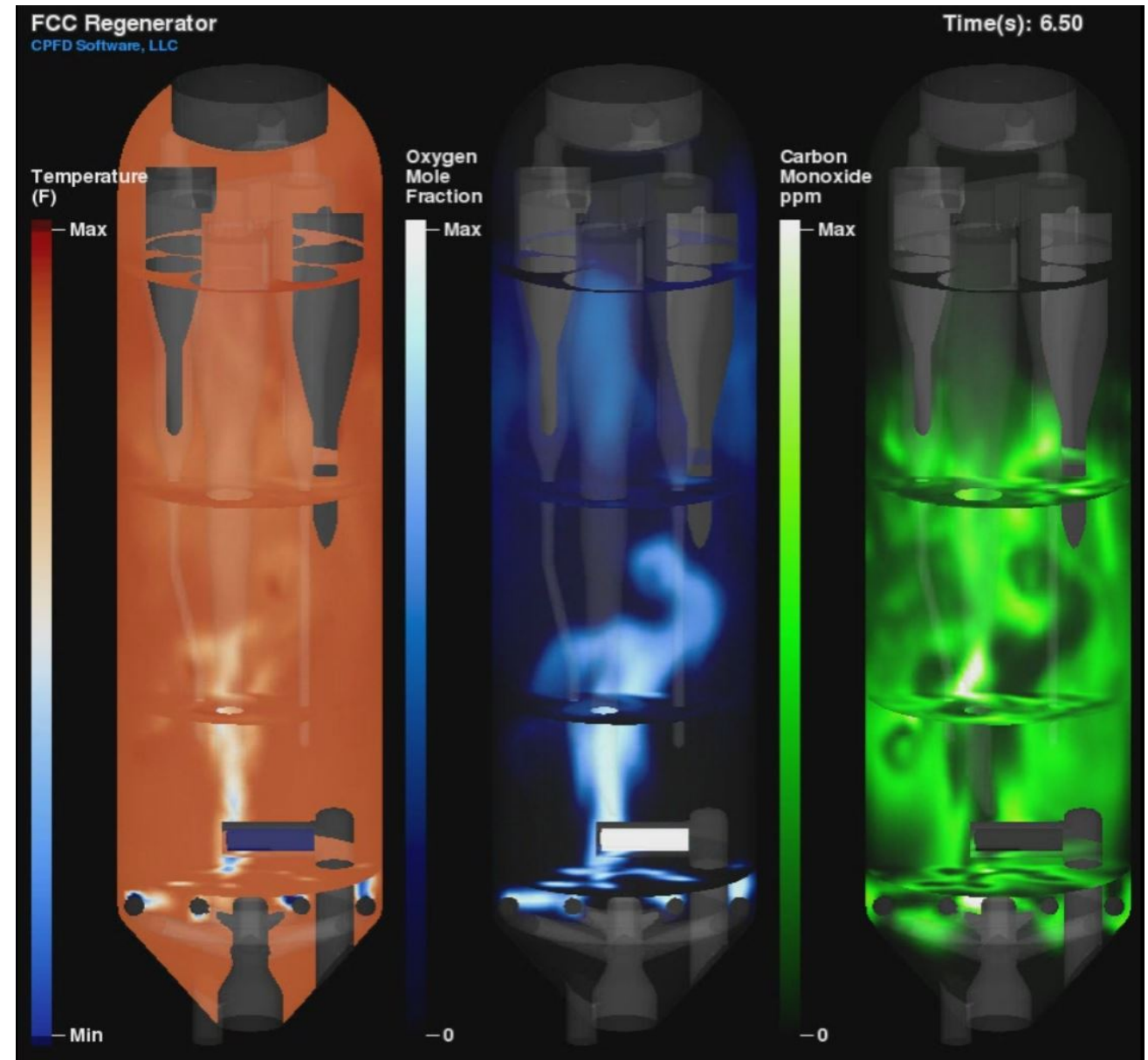
# Roadmap in Detail: Intelligent Inputs

- Help user get “Good in”
- Provide guidance
- Promote best practices
- Reduce time required
- More documentation



# Roadmap in Detail: Intelligent Analysis

- Automate common post-processing
- Monitor my run
- Remove need for scripts
- Better post-processing tools



# Roadmap in Detail: Intelligent Parametrics

- Numerical parametrics
  - Models and settings
  - Grid resolution
  - Particle resolution
  - Chemistry
- Sensitivity to process conditions
  - Boundary conditions
  - Initial conditions
- Design parametrics
- Automated parametrics



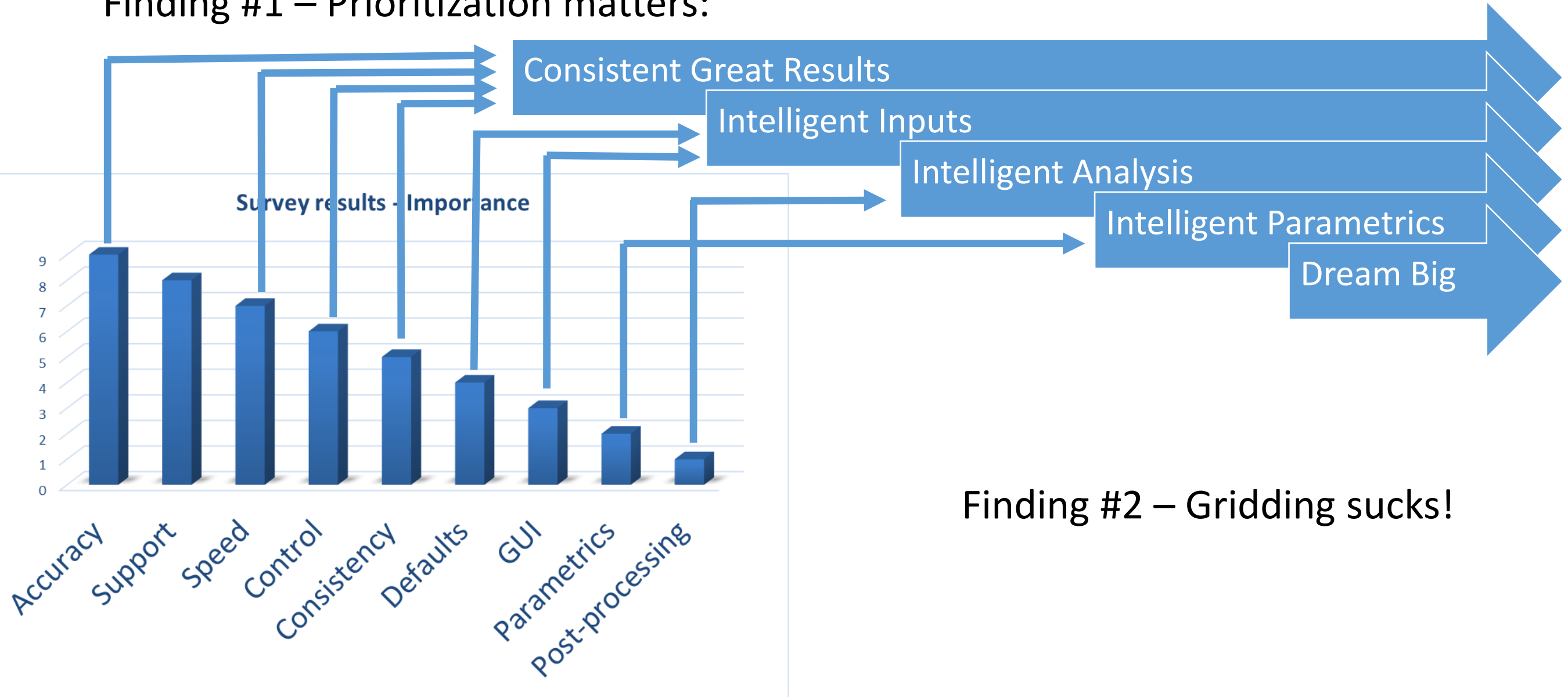
# Where We're Going: After 17.1

- Accuracy
- Speed
- Better Meshing
- Post-processing
- Interface Guidance
- More User Defined Parsers



# Survey Results (so far)

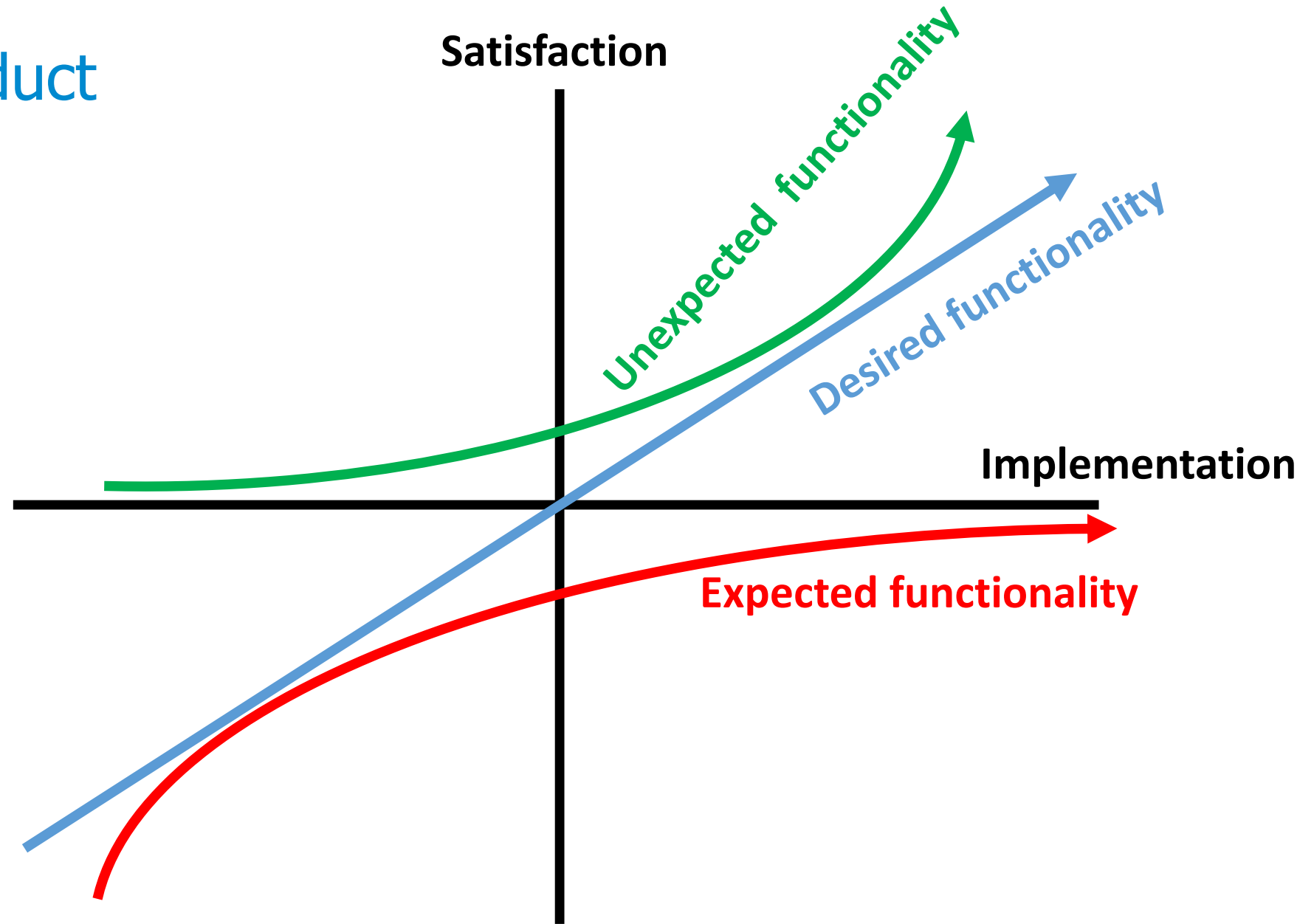
Finding #1 – Prioritization matters:



Finding #2 – Gridding sucks!

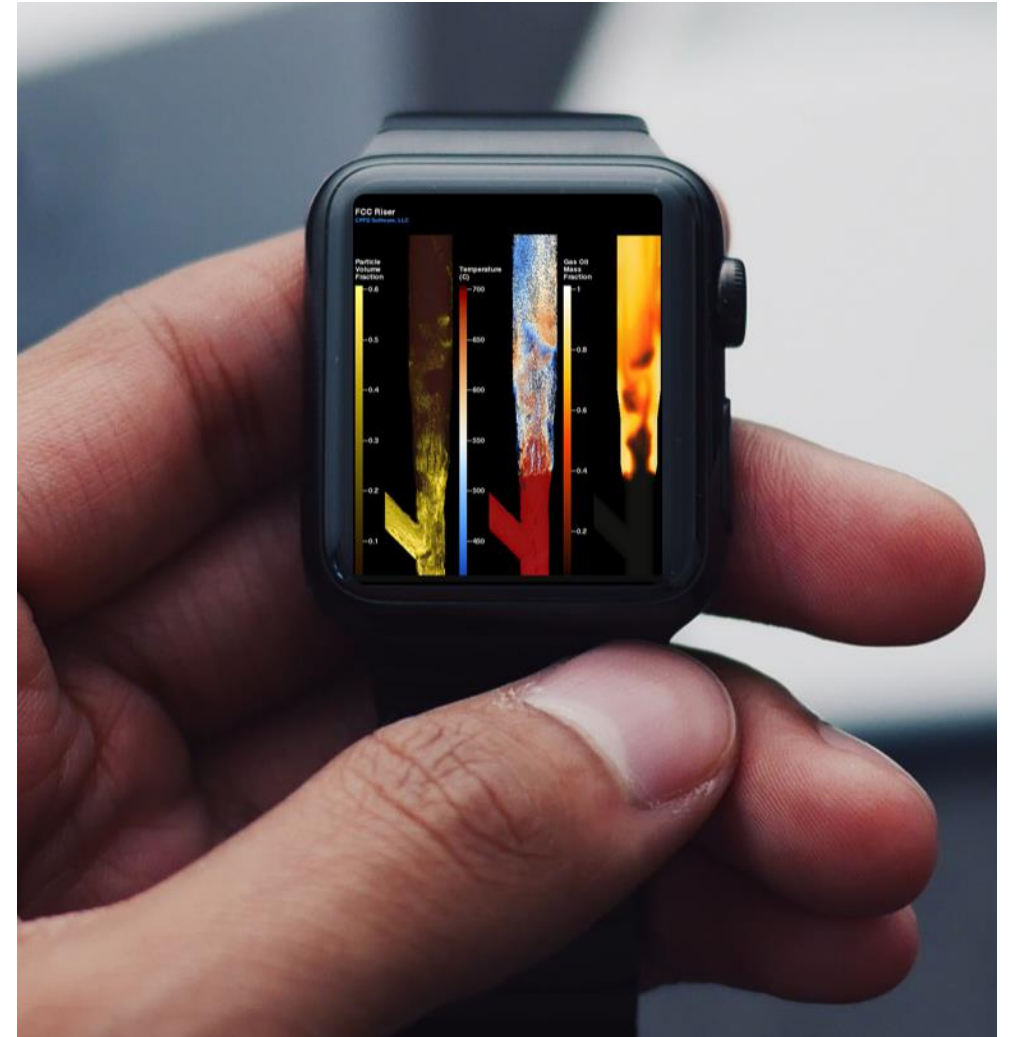
# Understanding the Product

- How to determine priorities?
- Kano Model
  - Satisfaction vs Implementation
- The Future:
  - Remedy expected
  - Prioritize desired
  - Do something exciting



# Dream Big: To Infinity and Beyond

- Easy Parametric Comparison
- Speed approaching real time?
- Auto resolution (spatial and temporal)
- Run anywhere, from anywhere
- Virtual Reactor -> Virtual Pilot Plant?
- Auto-Optimization



# Thanks!

- Questions?
- Let's eat?!

