# No Heat Spray Drying Technology

**DE-EE0005774**

**ZoomEssence, Inc.**

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# Project Objective

- **Advance research from prototype dryer to integrated pilot system for our ambient temperature spray drying technology**

- **Several objectives:**
  - Improve emulsion formulation
  - Develop an industrialized atomizer
  - Develop a dryer control system

- **Challenge is to convert liquids to powders at ambient temperature**
  - First commercial market is dry flavors designed to retain attributes of the starting liquid flavor

- **Traditional spray dryers operate at 200°C while our technology operates at much lower temperature causing significant reduction in drying power – opens new challenges**

# Technical Approach

- **Present spray dryers operate at high temperature ~200°C resulting in:**
  - Loss (evaporation)of flavor molecules
  - Oxidation and thermal alteration of flavor profile
  - Low thermal efficiency

- **Our process dries powders at low temperature resulting in:**
  - Avoiding the evaporation or distortion of flavors
  - Higher thermal efficiency
  - Significantly increased manufacturing yield

- **Low temperature approach requires change from existing practice**
  - Requires novel dryer designs for long particle residence times
  - New emulsion formulations
  - New atomization technology

# Technical Approach

- **Utilization of high performance computation to solve:**
  - Fluid dynamics problems of dryer air flow
  - Particle drying - heat and mass transfer
  - Particle trajectories to develop new dryer designs specifically for low temperatures

# Transition and Deployment

- **Dry ingredients are used worldwide in industries such as pharmaceuticals, food and chemicals to name a few**
  - Industries that demand superior retention of high value ingredients
  - Dry form of the ingredient is preferred

- **Consumers are the predominant end user in the form of tablets, capsules, dry food ingredients such as flavors, vitamins, milk powder, fertilizer, etc.**

- **Current high temperature drying causes issues relating to yield, performance, solubility and stability**

- **Everybody cares,** this a disruptive technology that delivers better products at a lower cost
  - Entire population consumes dry ingredients in various forms

# Transition and Deployment

- **First commercial application is the dry flavors & food ingredients**
  - CEO of ZoomEssence was former President of a large flavor company

- **Technology is sustainable, energy efficient and green**
  - Consume 60% less energy than current process
  - Improved yield causing need to manufacture fewer pounds of product
  - Avoids air pollution by not evaporating active material
  - Consumes significantly less water
  - Capital cost of the system is significantly less

# Measure of Success

- **Our process will result in significant reductions in energy consumption in the spray dry industry**
  - In excess of 60% less energy needed to deliver 1kg of dry flavor when compared to traditional high temperature spray dry processes

- **Commercial adoption by ZoomEssence selling dry flavors and ingredients to both US & International customers**

- **The low temperature process is more efficient in the use of natural resources such as water, flavors, pharmaceuticals, ingredients, and chemicals – little loss of valuable actives to evaporation**

# Project Management & Budget

- **Project is 1 year in duration**

- **3 Tasks Include:**
  - Improvement in Emulsion Formulation
  - Continued Atomizer Development
  - Development of a Dryer Control System

- **Progress measured by specific milestones and accomplishments with prototype dryer**

| Total Project Budget | |
|---|---|
| **DOE Investment** | $750,000 |
| **Cost Share** | $250,000 |
| **Project Total** | $1,000,000 |

# Results and Accomplishments

- **5 months into project**

- **Accomplishments to date:**
  - Measurements made to date on emulsions and dried powders have resulted in improvements in viscoelastic properties of emulsions – viscosity reduction achieved
  - Results in improved atomization – particle size
  - Improved drying behavior
  - Improvements in thermal stability of dried powders
  - New atomizer design in progress
  - Companies identified for manufacturing atomizer
  - Control panel functions defined, all sensor and control points identified, programming starting