

# Multiple Grinding Techniques to Reduce Particle Size: An Interview with Jeffrey A. Klinger

*Interview conducted by Kal Kaur*

## Insights from Industry

### Jeffrey A. Klinger

*Vice President, Custom Processing Services, Inc.*



*Jeffrey A. Klinger, Vice President and Co-founder of Custom Processing Services, Inc. talks to AZoM about multiple grinding techniques to reduce particle size.*

**KK : What are the main methods used to achieve custom processing coarse grinding results?**

**JAK :** Coarse grinding can be achieved in many different ways. Typically we start off with drastic size reduction by running the product through a series of jaw crushers and pass this material through our rotary kiln dryer if moisture reduction is required. The continuous process carries the product from the dryer to our impact crushers to further reduce the size. The material is then sized to customized “mesh” particle sizes by screening the material over a series of different screens to meet the customer’s specifications.

**KK : What are your main wet and dry grinding techniques to help reduce particle size?**

**JAK :** Our main dry micronizing technique utilizes the latest fluidized bed jet milling technologies. High output and steep cut grinding is achieved by creating gas streams from horizontal grinding nozzles delivering air streams accelerating at supersonic velocities promoting particle-to-particle collisions.

The micronized particles travel up the milling vessel entrained with the rising air velocity toward an integrated dynamic air classifier that can be infinitely adjusted to targeted sub-micron particle sizes. Even the hardest of products and extremely temperature sensitive materials pose no problems for this technology.

For wet milling and nano-sizing, we use media mills of all sizes. This technique uses a pre-mixed slurry which disperses particles in a liquid and recirculates the slurry through the mill’s enclosed vessel filled with small ceramic spheres or “media beads” that are activated by a high speed agitator shaft creating shear and impacting forces. These recirculating forces enable particles to be reduced to nano-sized particles, which typically cannot be reached using dry grinding methods.

**KK : What are the main benefits of your mineral pulverizing system?**

**JAK :** Should the material need finer “coarse” grinding, the material can be pulverized using an air swept mill that allows grinding and classifying to take place simultaneously. The pulverized material from the grinding zone is carried by the air stream to a classifier which is controlled to meet the target particle size.

With this process, the use of dynamic separators permit instant adjustment and provide flexibility of operation producing cleaner top-size cuts to 325 mesh for finer mineral grinding applications while maintaining a very high capacity output. This process enables high quality at a low cost for large volume industrial applications.

**KK : What processes do you work with to help take your R&D products onto commercial scale production?**

**JAK :** Trained engineers and qualified technical staff utilize a full array of feasibility and pilot scale particle reduction and blending equipment, used to scale up to production size processing systems. These GMP and technical grade processes include but are not limited to wet nano-sizing, dry micronizing, dry blending, and liquid dispersions.

By performing small scale trials, customers can test different particle sizes, formulations, and processes to meet their end goals.

These R&D processes also provide enough information to scale up from grams to production quantities while providing ball park processing estimates. A complete laboratory for particle characterization aids in the R&D for new products.

**KK : How do you customize for cGMP manufacturing?**

**JAK :** Customization can happen in many different ways. A customer presents us with a challenge opportunity. Between our customers and our technical engineers, a game plan is set forth on how to process the material. Once the process is established and agreed upon, the next steps provide the customization necessary to get the product to the food, dietary supplement, nutraceutical and pharmaceutical markets.

The HACCP team performs a customized hazard analysis based on the process. Customized cleaning and process validations are performed and documented. Bioluminescence swabs for microbial and allergen clean verifications are established.

In-House HPLC testing for individual product purity will be performed. Depending on the process, IOPQ (Installation, Operational, and Performance Qualification) is conducted with full traceability and documentation.

**KK : Are there any development efforts with your services that have been affected by changes in the commercialization of nanotechnology?**

**JAK :** The development of nanotechnology has opened up many R&D opportunities. These opportunities offer huge potential in the electronic, information technologies, and healthcare industries. There are many established, new start-up and research companies that are seeking out our nano-grinding services.

Our services allow scientists to realize that nano-sized particles offer various materials to enhance their optical, mechanical, thermal and electrical properties and to create functional new materials. We can take R&D concepts from the lab into full-scale production.

**KK : What are you doing to help enhance the performance of your processing services?**

**JAK :** We are always looking for the latest designs in existing processing technologies as well as adding new and different processes. In order to meet or exceed our customer's expectations, we are continually adding different types of processing equipment.

This year we just installed a new \$1MM bio-kill system utilizing a jacketed heat screw to perform a bio-kill step using validated temperature and residence time limits. We have also installed a new 26mm twin screw extruder targeting the powder coating markets. Later in the year, we anticipate adding a pelletizer and fluid bed drying line to enhance our overall service performance. We aim to be a "one-shop-stop" for many of our customers.

**KK : Do you have a case study that reflects your biggest challenge to date when it comes to diversifying and improving your custom services?**

**JAK :** A case study which illustrates our ability to diversify and improve our custom services involves a specialty blend manufacturer client of ours. Initially we were only providing particle size reduction services to them. As our business relationship grew, we learned that they were encountering some difficulties with the raw materials required for their process.

We volunteered to source the raw materials for the client, process it, and add it to the other components in a tightly controlled loss-in-weight system. From there, we installed a custom packaging line for this client. Next, we offered our warehousing and distribution services, plus those of our trucking firm, and thus were able to fulfill many segments of the supply chain for the client.

**KK - Where can we find further information on your company processes?**

Further information can be accessed on our company site: [www.customprocessingservices.com](http://www.customprocessingservices.com)



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