

# ENGINEERING SERVICES

## FOR LUBRICANT PRODUCT MANUFACTURERS

Kettle and Tank Design  
for Demanding Lubricant  
Manufacturing Applications

Because they face unique safety and operational challenges in production, it is valuable for manufacturers of lubricant and grease products to assess their process equipment systems. This overview from the engineers at Lee Industries can help lubricant manufacturers deploy production vessels that will significantly improve their batch formulation, mixing and processing performance.

## [ 1 ] Design, Engineering and Fabrication

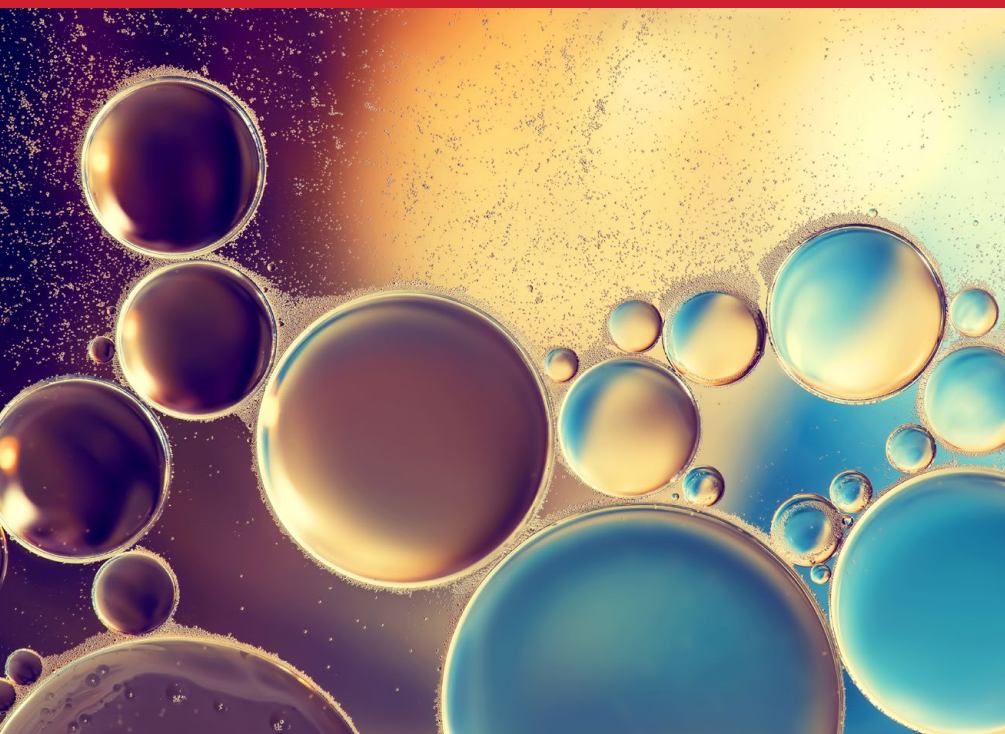
The Lee Industries team of skilled fabrication professionals has built thousands of kettles, tanks and related mixing and processing equipment for the world's largest and most recognized industrial processors, including manufacturers of a variety of specialty lubricants. Our deep experience in solving mixing and processing challenges, while meeting delivery schedules and budgets, can be a valuable contributor to success in the lubricant product industry.



**We provide a full range of process engineering services to manufacturers of lubrication products, as well as to skid manufacturers and third-party integrators providing engineered design/build process systems to their customers.**

Our design and engineering teams understand the many changes and approvals required during the vessel design process. We work alongside both plant owners and skid manufacturers to incorporate these changes into the vessel design, both before and during the fabrication stage.

With the completion of our new production facility, Lee can meet the needs of large-scale manufacturers with vessels in excess of 50,000-gallon capacity.



## Tech Focus:

### Meeting Vessel Fabrication Challenges for Lubrication Manufacturing Applications

*Production requirements for lubricant manufacturing applications pose these critical fabrication and performance challenges:*

#### Higher Heat and Pressure:

Lubricants are often processed at very high temperatures, and/or under very high operating pressures. During processing, some chemical ingredients create exothermic reactions, which further increases temperatures inside the vessel. For safe and efficient heating and cooling under these conditions, lubricant manufacturing vessels must often be designed with additional jacketing to maximize the vessel's heat transfer area, and be designed for high pressure to accommodate higher processing temperatures. Overall, production vessels for lubricant manufacturing must be built for extra durability, using heavier gauges of stainless steel, added reinforcement and other heavy-duty construction features to ensure long-term operation and reliability.

#### Vacuum Process Requirements:

Lubricant manufacturing often involves the use of extremely fine powder-like additives, which makes it a requirement to incorporate vacuum capability into the production vessel. From a safety standpoint, loading finely-ground powders into the vessel under vacuum minimizes the health risk to operators and plant personnel from toxic airborne particles, since the vessel is a closed unit, allowing a vacuum to pull all the dry powder instantly into the liquid mix during loading. Loading and mixing under vacuum also prevents the powder from collecting and clumping on the top and sides of the vessel during agitation, resulting in faster and more complete mixing of all batch ingredients.

#### High Viscosity Mixing:

Production vessels designed to mix higher-viscosity lubricant products, such as greases, require heavy duty construction of agitator shafts and drive units for reliable long-term operation. When designing vessels for these applications, we often specify thicker agitator drive shafts, and gearboxes and motors capable of mixing materials at viscosities above those of the customer's product. This minimizes long-term wear and stress to critical drive components.

## [ 2 ] Project Management

Our approach to project management is a key difference between Lee Industries and other vessel manufacturers. For example, at other vessel manufacturers, once the customer places an order, ongoing management of the project may shift from the initial salesperson to several others inside the company to handle day-to-day management of vessel design and production.

At Lee Industries, every member of our sales team is a highly-skilled and experienced applications engineer who becomes your project manager and sole point of contact throughout the entire design, fabrication, QA and delivery stages of your project. Having a single point of contact enables you to resolve important issues quickly on every aspect of your complex vessel design. As the project manager, your Lee applications engineer provides all updates for approval prints, shipping and delivery dates, and regular milestone progress and status reports.

**Your Lee applications engineer becomes the project manager for your vessel fabrication project and is your single point of contact, ensuring clear communication, regular status updates and prompt resolution of vessel design, production and delivery issues.**

Upon receipt of approved drawings, the job is released to the shop for a full fabrication and a completion date is assigned. Coordination between the project manager and production floor supervisors in all departments, combined with regularly scheduled weekly production meetings, helps to ensure on-time delivery of your project.

## Lee Industries Certifications:

- ISO 9001:2008 Registered Quality Management System
- American Society of Mechanical Engineers (ASME) Certification of Authorization to use current U and UM stamps
- 3-A Certified Ball Valves
- National Board Certification of Authorization to register and repair pressure vessels using NB and R stamps
- European Pressure Equipment Directive (PED) and CE marked vessel certifications
- Canadian registration
- Certified to build to the Singapore Ministry of Manpower (MOM) requirements



## Processing High-Tack, Explosive or Corrosive Lubricant Ingredients:

To optimize productivity and safety, vessel specifications must reflect the unique chemical properties of the ingredients used to create the product. For example, when processing and mixing high-tack lubricants, highly-polished internal and sidewall surfaces will enable more efficient mixing operations and shorter vessel cleaning times (Lee's in-house polishing capabilities provide surface finishes of less than 6 Ra average for mechanical finishing and 12 Ra maximum for electropolishing). Properly designed motors and drive units, along with other safety features, can be specified when potentially explosive ingredients are used.

Vessel material choice is an important concern when processing corrosive materials under high temperatures, especially when these materials remain in the vessel for extended time periods. Stainless steel -- or other steel alloys offering even greater corrosion-resistance, such as AL6XN, Hastelloy®, stainless duplex alloys or Incoloy® -- should replace carbon steel in vessel body construction.

## Multiple Vessel Penetrations:

Lubricant production vessels often require different attachments that penetrate the body of the vessel to allow for temperature measurement and monitoring, sampling, agitation and other specialized process requirements. Since each of these surface penetrations may create individual hot and cold spots on the vessel's surface, precautions must be taken during the layout and design stages to maintain the vessel's heating and cooling performance. During fabrication, special skill is required to prevent heat warpage to the vessel surface, as fittings and attachments for these openings are welded in close proximity to each other.

## Food-Grade Requirements:

Food-grade lubricant manufacturers may require enhanced sanitary design features for the vessel, including clean-in-place (CIP) capabilities or other features required to meet national and international food safety standards. Lee's extensive experience in both sanitary food processing and lubricant processing can help you design the proper specifications for food-grade manufacturing.

## [ 3 ] Validation and Quality Assurance

To meet your project's stringent validation and QA requirements for lubrication applications, Lee Industries holds ISO, ASME, European PED, CE, Canadian and Singapore pressure vessel and manufacturing certifications.

Before vessel production begins, source materials used for the project are inspected upon receipt with our Positive Material Identification (PMI) gun for non-destructive verification of chemical alloy composition of stainless steels and other metals used in production. Lee Industries performs routine vendor audits to verify ongoing quality for materials and components used in the manufacture of its vessels. During vessel fabrication, welds are carefully inspected throughout the project with our in-house borescope system to verify weld integrity. Other tests, such as comprehensive dimensional checks, surface measurements and hydrostatic testing, are performed throughout the vessel fabrication stage.

**We provide full documentation to meet your company's critical Factory Acceptance Testing and Site Acceptance Testing validation requirements, with complete traceability to QC certificates, welding logs and material test reports, if required.**

For lubrication vessel projects, your company can make use of our offsite inspection facility in Tipton, PA, where vessels can be moved to provide sprayball tests and additional extensive performance testing by your company's QA, validation and inspection teams.

In addition to the required international, industry and ASME pressure vessel certifications, Lee Industries implements a seven-point internal inspection process prior to releasing every vessel for shipment. Here, every design and production team member involved in a vessel project performs their own rigorous independent inspection on each production vessel before it ships from our facility.



## [ 4 ] Installation, Start-Up and Commissioning

Proper installation and start-up of complex vessels for lubricant manufacturing applications is critical to prevent installation damage and to ensure safe operation compliant with your company's processing requirements. To assist you at this stage, our ASME-certified field service crew is available to travel to any location in the U.S. or internationally to provide installation supervision and start-up assistance for your new processing vessel.



**Our field service team can support specialty lubricant manufacturers by making on-site repairs and post-delivery modifications, such as installing new vessel connections. When field modifications are made, our team can also re-certify the vessel on-site.**

## Our Production Facility: Size and Capabilities

With the addition of our new 43,000 square-foot facility in 2017, our production floor area now totals 130,000 square feet. This newly expanded capacity not only allows us to increase our production, but enables us to create larger-capacity vessels of 50,000-gallon capacity and higher.

We maintain a complete in-house vessel production capability, which includes all forming, welding and related machining and finishing operations. Our reputation for quality is the net result of the skill and knowledge of our design and engineering teams, and especially our team of production craftsmen, whose decades of skilled fabrication experience in all the metalworking trades—forming, welding, fabrication and finishing—ensure that your final production vessel will meet or exceed the challenging requirements of your lubrication process.





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At Lee Industries, our goal is to build vessels of the highest production quality to meet our customer's most challenging needs. Contact us for more information, or to discuss your project.