

# PROCESS CAPABILITY

**What are CP and CPK as applied to grease dispensing?**

## DEFINITIONS

**Cp = Process Capability.** A simple and straightforward indicator of process capability.

**Cpk = Process Capability Index.** Adjustment of Cp for the effect of non-centered distribution.

### Interpreting Cp and Cpk

"Cpk is an index (a simple number) which measures how close a process is running to its specification limits, relative to the natural variability of the process. The larger the index, the less likely it is that any item will be outside the specs." Josh Hendrick

"If you hunt or shoot targets with bow, darts, or gun, try this analogy. If your shots are falling in the same spot forming a good group this is a high Cp, and when the sighting is adjusted so this tight group of shots is landing on the bull's-eye, you now have a high Cpk." Kevin Reeves

"Cpk measures how close you are to your target and how consistent you are to around your average performance. A person may be performing with minimum variation, but he can be away from his target towards one of the specification limit, which indicates lower Cpk, whereas Cp will be high. Or a person may be on average exactly at the target, but the variation in performance is high (but still lower than the tolerance band (i.e. specification interval). In such case also Cpk will be lower, but Cp will be high. Cpk will be higher only when you are meeting the target consistently with minimum variation." Gord Reeves

"You must have a Cpk of 1.33 [4 sigma] or higher to satisfy most customers." Ken Hirst

"Cp should always be greater than 2.0 for a good process which is under statistical control. For a good process under statistical control, Cpk should be greater than 1.5." Bill Hitchcock

Thanks to everyone above who contributed to this reference.

## GREASE DISPENSING TRUTHS

1.	Only positive displacement piston dispensers are capable of the accuracy and repeatability necessary to obtain high CP and CPK numbers with grease.
2.	Only dispensing systems that are operating with <u>airless grease</u> are capable of obtaining high CP and CPK numbers.
3.	Timed dispense systems (without positive displacement measuring dispensers) are not capable of high CPK or CP numbers because grease changes viscosity with temperature and from batch to batch.

**See page two for a histogram that will impress  
any process engineer**

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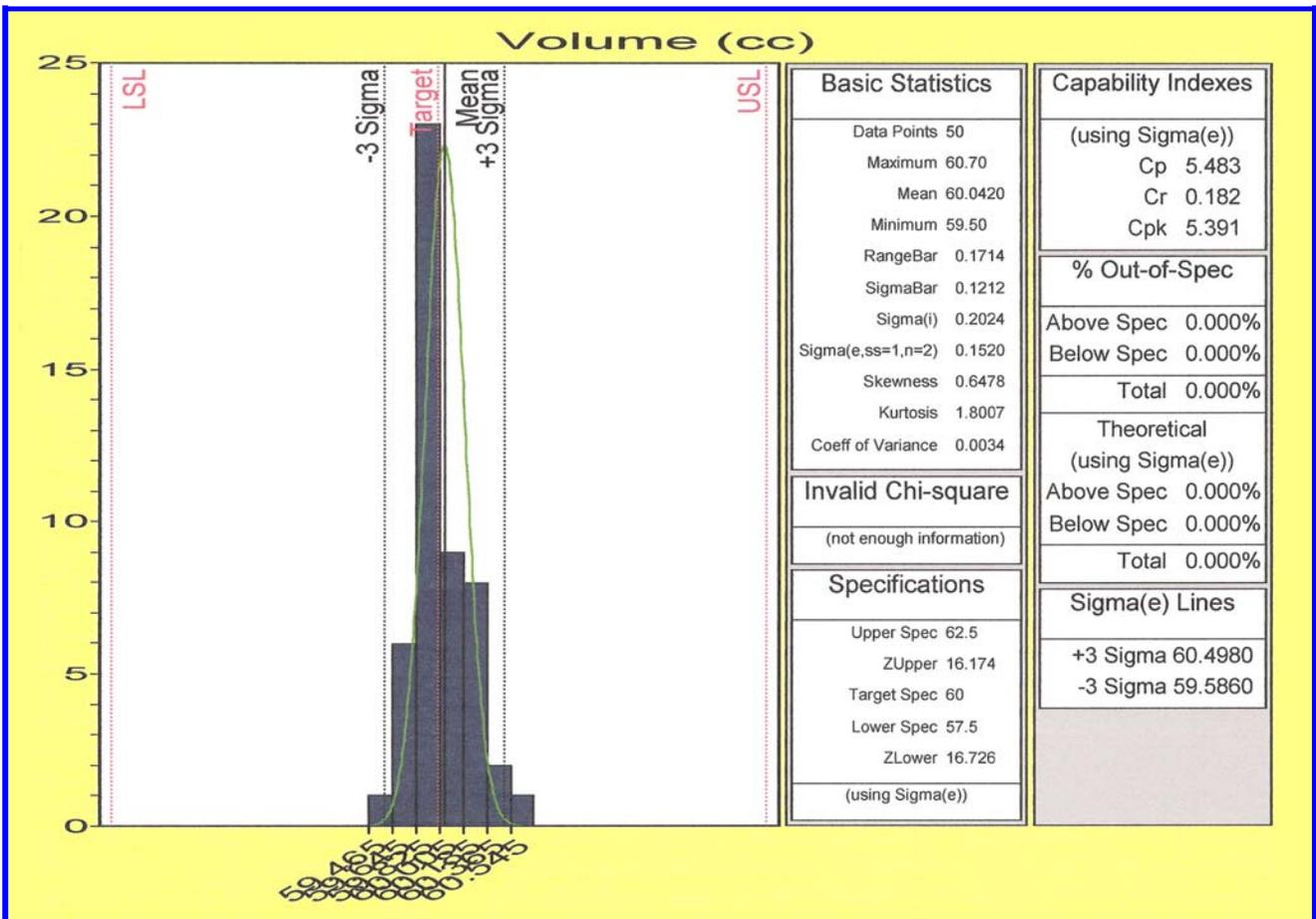
**Fax: 616.399.8867**

**Web Site: <http://gpreeves.com>**



The Analog Air Purge Grease Pump (AAPGP), control panel, and snuff-back device shown in the photos are used to dispense precise volumes of grease into automotive components during manufacture. Before purchasing this equipment, automotive components were occasionally shipped with no grease or not enough grease resulting in complaints, rejects, and a lack of confidence in quality control. The results of a 50 shot capability study are shown below.

Analog Air Purge Grease Pumps (AAPGPs) are manufactured by G. P. Reeves Inc. under US patent number 6,053,285.



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