

ABA-PGT Robust Tool Development Program

Tool Development Goals:

- Ship quality production parts (CPk >1.33)
 - In a 24/7 environment
 - In any machine, by any setup person
 - Immediate startup
 - High volume, using the same tool for the life of the program, minimal downtime

How is this done?

- By using ABA-PGT's robust tool development program, summarized below.
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- Customer orders tool and sample parts

Tool build

- Project Manager (PM) is assigned project
- Engineering meeting with customer to discuss part design, gear design, tool design, quality requirements
- ABAPGT internal meeting to discuss project (part shrinkage, plastic material, gauges, master gears, etc)
- Tool design (and gear design)
- Tool build cycle

First mold test

- Setup mold in machine
- mold 1st shots and window study samples from 9 sets of parameters, for example:

	<u>cycle</u>	<u>inject pressure</u>
16 shots	10 seconds	10,000 psi
16 shots	12	10,000
16 shots	14	10,000
16 shots	10	12,000
16 shots	12	12,000
16 shots	14	12,000
16 shots	10	14,000
16 shots	12	14,000
16 shots	14	14,000

- QC inspects parts from each of the 9 processes (1 cavity)

ID	OAL	GTR	TCT	TTT	Gear Od
ID	OAL	GTR	TCT	TTT	Gear Od
ID	OAL	GTR	TCT	TTT	Gear Od
ID	OAL	GTR	TCT	TTT	Gear Od
ID	OAL	GTR	TCT	TTT	Gear Od

ID	OAL	GTR	TCT	TTT	Gear Od
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ID	OAL	GTR	TCT	TTT	Gear Od
ID	OAL	GTR	TCT	TTT	Gear Od

- Focus is on obtaining a robust process, and not to meet dimensions
- QC and PM review data, pick the best process (least variability)
- QC inspect the process that was picked
 - full layout 1 piece/cav
 - CTF 16 pieces/cav (ID)
 - CTF 16 pieces/cav (OAL)
 - CTF 16 pieces/cav (critical feature)
- PM reviews data, decides how to fix steel (alter some details, build some new details)

Steel Adjustment #1

- place order to adjust steel
- tool work
- deliver steel details to the PM

Second Mold Test

- setup mold
- mold 150 shots
- PM and QC reviews preliminary inspection data

Do we proceed with inspection?

Yes	No, need further tool adjustments
<ul style="list-style-type: none"> - proceed as noted below 	<p>Steel adjustment #2 Third Mold Test</p> <p>(Sometimes)</p> <p>Steel adjustment #3 Fourth mold test</p>

- PM decides to proceed with inspection
- QC inspect parts
 - FAI on each cavity
 - Submission paperwork is generated
 - Gauge R&R
 - Capability study
 - cooling study
 - PFMEA
- PM submits samples, all QC data and paperwork as well as:
 - Tool approval form
 - Deviation request

- Certs and C of C
- control plan
- flow charts

Receive tool approval from Customer

- PM starts the ECN process
 - releases open orders
 - updates customer drawings, gear data, setup guides
 - physically delivers tool to production
- QC
 - updates all QC database records
- Production
 - creates job traveler
 - orders material
 - schedules production job

Production molding Starts

Comments about production runs:

- Because of the robust tool development process:
 - allows for smooth production runs with minimal downtime
 - allows flexibility to schedule runs in multiple machine and on any shift
 - eliminates dimensional (out of tolerance) “surprises” that causes downtime and further tool adjustments
 - production tools can run parts for the life of the program (it’s not uncommon for tools to run for over 15 years)
 - tools are guaranteed for 1,000,000 cycles
- With good communication with our customer, level scheduling throughout the year can be attained (eliminates “urgent” deliveries).

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