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| --- | --- | --- | --- | --- | --- |
| **Project title** | Reduce Alpha Case on Large Titanium Castings | | | | |
| **Problem statement** | “Alpha case” is an oxidation layer commonly found on titanium castings in the as-cast condition. It must be removed by chemical milling. Alpha case is measured by chemical analysis of coupons taken from the castings. The upper specification limit for O2 is 200 PPM. Over the past six months, post-milling O2 levels on large titanium castings have gradually trended upward. It has become common practice to send castings back for one or more extra chemical mills to bring the O2 below 200. Each extra cycle reduces our profit margin by $TBD and adds TBD days to the lead time.  In the past two months, repeated chemical milling has failed to solve the O2 problem for increasing numbers of castings. Instead, these castings are scrapped for dimensional nonconformance. This has resulted in scrap costs of about $400,000 per week, and has severely hindered our ability to meet delivery schedules. | | | | |
| **Goal statement (qualitative)** | We should never have a casting with O2 exceeding 200 after first chem. mill. We should never have a late delivery. | | | | |
| **Value stream scope** | Large titanium castings in general, one bellwether part number in particular. | | | | |
| **Workflow scope** | Starts with ceramic slurry make-up, ends with a finished casting. | | | | |
| **Out of scope** | * Small titanium castings * Castings made from non-titanium alloys | | | | |
| **Constraints** |  | | | | |
| **Concerns** | Currently, our yield for large titanium castings is close to 0%. We must move quickly to solve this problem. | | | | |
| **Assumptions** | We will solve this problem. | | | | |
| **Project metrics** | **Baselines** | **Goals** | | **KPIs affected** | |
| O2 > 200 after first mill | 100% | 0% | | * Quality * Delivery * Cost | |
| Dimensional conformance |  | Do no harm | |  | |
| Metallurgical integrity |  | Do no harm | |  | |
| **Team members** | **Roles / Responsibilities (Green Belt, Black Belt, Leader, Scribe, Job Title, etc.)** | | | | |
|  | Ceramic process engineer | | | | |
|  | Foundry process engineer | | | | |
|  | Titanium metallurgist | | | | |
|  | Part engineer | | | | |
|  | Engineering manager | | | | |
|  |  | | | | |
| **Resources** | **Roles (Champion, Black Belt, Process Owner, Finance, IT, HR, Facilities, etc.)** | | | | |
|  | IT person | | | | |
|  | Master Black Belt | | | | |
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| **Stakeholders** | **Connection to project** | | | | |
|  | Plant Manager | | | | |
|  | Customers | | | | |
|  | Everyone involved in production of large titanium castings | | | | |
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|  |  | | | | |
| **Milestones** | **Plan** | | **Actual** | | |
| Project start |  | |  | |
| Define phase complete |  | |  | |
| Measure phase complete |  | |  | |
| Analyze phase complete |  | |  | |
| Improve phase complete |  | |  | |
| Control phase complete |  | |  | |