

Improved Performance, Cost Reduction and Waste Minimization: How to improve parts recycling with ThermaGas® Parts Recycling.

Over the past several decades, engineers in the semiconductor manufacturing companies have continually strived to increase productivity while reducing costs. When expensive parts, tools and increasingly expensive manufacturing systems are performing properly, engineers can maintain control and adjust processes accordingly.

However, when budgets and schedules tighten, tools can get overloaded and part maintenance deteriorates. Parts can underperform or worse – fail - costs can skyrocket, production lags, and performance and planning distorts at critical junctures in the manufacturing process.

So how can engineers overcome these costly and unproductive episodes from ever happening? Fortunately, enhanced cleaning solutions now exist that can combine and extend parts recycling and performance with superior cost of ownership savings. This provides a significantly enhanced and efficient parts' recycling and monitoring program for manufacturers, and increased product reliability and satisfaction for end users.

Why Use A Parts Recycling Program?

- High competition / economies of scale
- Increased costs of ownership
- Decreased reliability

Challenges Facing Manufacturers And Parts Recycling

There are three primary challenges facing manufacturers who do not recycle parts: High replacement costs, contamination and decreased performance / reliability.

Replacement Costs vs. Recycling

Inflationary pressure, parts supply and the sheer volume and frequency of replacing and repairing parts can present serious challenges for manufacturers trying to control spiraling production costs while still maintaining high production standards.

Part replacements burden manufacturers with far higher cost of ownership than recycling, and provides greater process and manufacturing inefficiencies over the long term. This includes accounting for all tool breakdowns, set up and break ins of new parts, man hours, and retraining, if necessary.

Contamination

Abrasive material resurfacing, bead or media blasting and wet chemical etchants are the leading methods current Fabs employ to remove parts contamination. Although these older cleaning technologies can be inexpensive, fairly easy to deploy and are effective on harder materials (such as steels and molybdenum), they can, however, be very detrimental to softer materials such as ceramics, graphite and coated graphite materials.

The abrasive processes distort softer surfaces, and can cause premature wear on critically dimensioned areas as well as can carry contamination back onto crucial part surfaces. These surfaces will then need to be out-gassed before being reinstalled in a tool or use up valuable time in a production tool before being subsequently re-qualified for production.

Wet chemical etchants alone can clean many harder materials such as aluminum and steel, but softer materials, such as ceramics and graphite, easily absorb the chemicals into their porous surfaces. This particular solution not only contains acidic (or alkaline) components, but all the waste elements of the parts contamination as well. Even though parts can be rinsed several times, not all contaminants can be removed - mostly due to the difficulty of overcoming capillary effects and entrapment deep down in the parts pores. A bake out can assist in removing moisture, but this procedure cannot remove the heavier elements that have been absorbed into the surface.

Long term use of these older processes can present serious stability issues for engineers, and can ultimately result in parts damage each time they are cleaned and will subsequently need to be retired and thrown out.

Unreliable Parts Performance

Abrasive material resurfacing, bead / media blasting and wet chemical etchants can all contribute to decreased part performance and reliability. These processes can wear down and fatigue parts excessively, resulting in parts being exposed to hazardous wear and degradation, and ultimately, unreliable part performance.

Long term effects from these processes can also pose problems for tools, as well. Long term excessive wear can slowly diminish a tools capacity to perform to established specs, causing engineers to increasingly recalibrate instruments, creating still more productivity lags.

The Solution: ThermaGas® Cleaning Technology

To overcome the challenges of increasing costs, contamination and unreliability, manufacturers are seeking out new technologies and parts recycling to solve these problems. The newest breakthrough in cleaning technology is a completely “dry” cleaning process, and this process utilizes three primary components:

- Heat
- Vacuum
- Reactive Gases

Parts that need to be cleaned are fixtured and placed into a specially designed vacuum chamber. The ThermaGas® process is designed to remove the specific contaminants from the specific substrate. Heat and reactive gases are introduced into the chamber to remove the contaminants and evacuate them out of the reactor.

This process directly addresses the most problematic issues of the two major conventional cleaning processes:

- 1) Parts never come into contact with any abrasive cloths, i.e. Scotch Brite, or any other abrasive blasting media. This means that the new process will not wear down parts surfaces - allowing, theoretically, for parts to be cleaned indefinitely, without any changes to critical dimensions.
- 2) Reactive gases are chosen and selected for the removal of part contaminants, and they will not react with any base material. This process is especially beneficial when compared to media blasting or abrasive rubbing. Contaminated parts will never have a uniform thickness of contamination, and especially with bead blasting and “Scotch Brite” techniques, this may inadvertently cause the operator to create wear and defects on a good part surface while trying to remove the contamination.
- 3) Because this process utilizes reactive gases, the amount of parts contamination that needs to be waste treated is significantly less than that of media blasting or wet chemical etches. Most of the material being waste treated from the older processes consists of media materials or etchant chemicals, not the contaminants. Since it is very difficult (and excessively expensive) to separate the two waste streams (i.e. removed contaminants from the blasting media), the waste needs to be treated as a homogeneous mixture. Instead, the dry process removes contaminants and captures them in cold traps before allowing the residual gases to pass through a scrubber. The excrement waste can then be measured in grams (instead of pounds), resulting in a significant reduction in waste treatment costs and liabilities.

This process solves high cost replacement issues by creating long term, lower cost maintenance and monitoring procedures of all parts. It also solves reliability issues by creating zero-tolerance cleanings with virtually no parts wear.

Important Benefits of the ThermaGas® Process.

Several significant benefits can be obtained when manufacturers use dry cleaning technologies in their parts recycling programs.

ThermaGas® cleaning process can:

- Clean parts without changing critical dimensions
- Clean parts virtually forever
- Prevent particle and out gassing problems
- Significantly reduce spent material waste disposal issues
- Significantly reduce long term spare parts cost of ownership

What to Look for in a Recycling Solution Provider

When seeking a company to provide cleaning services and process improvements, be sure to consider several factors, including:

Program and strategic assessments: Look for a company that will provide honest diagnostic assessments of your current program, and that will suggest continuous improved to lower cost, not just recommend the “status quo”.

Delivers measureable results: A good program will provide real, quantifiable results that can be measured against current process to provide long term continuous cost reductions, lessen environmental impact and generate improved quality.

Minimal impact on current systems: The ideal provider will minimize retooling and modifications in existing systems, leaving current investments with little or no alterations.

Responsibility and accountability: Look for a provider who maintains a high degree of ownership with the program, ensuring a greater degree of long term results and whose employees display an honest investment in you and your company’s success.

Extensive support: Seek a company that will provide long term support and training, along with additional consulting or implementation service.

Advanced Cleaning Technology’s (ASC²T) ThermaGas® Recycling Program

Built from the ground up, ASC²T’s groundbreaking ThermaGas® dry cleaning technology was designed to be an environmentally conscious solution for today’s recycling challenges.

Located in Durham, CT, and founded in 2003 by several environmentally conscious engineers, ASC²T was created to combat the conventional cleaning processes and excessive waste being generated by the semiconductor industry. ASC²T strives to develop processes that provide indefinite cleaning of semiconductor tool parts while minimizing the resultant waste being generated.

Program Advantages

Working with ASC²T will provide you with several key advantages, including:

Consulting: ASC²T will work to understand your existing processes and establish new procedures for continuous improvement in parts performance and lowering of your costs.

Proven Integration: Both on site and remote services can be provided.

Extensive client list: Armed with a long listing of satisfied customers, ASC²T can be relied upon to provide you with a recycling solution that is specifically tailored to your requirements and manufacturing program.

Experience matters: ASC²T’s engineers are all senior level, and they understand what it takes to think about creative, long term solutions to help keep your ahead of the your competition.

To find out more about ASC²T and ThermaGas Dry Recycling, visit www.asc2t.com or call 1-860-349-1121.

