Paint Shop Life Cycle Management

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PROPER PLANNING CAN HELP MAKE YOUR PAINT OPERATIONS PRODUCTIVE FROM CRADLE TO GRAVE

The life cycle of any paint shop is best expressed in four phases. They are:

- Facility planning and specifications
- Facility construction
- Facility start-up/ramp-up
- Operation through the facility's lifespan.

For the user (OEM), there are generally two or three internal sources of expertise and knowledge available in each phase. They are facility managers, production and production support staff, and maintenance staff.

Outside the organization, there are many potential sources. Material suppliers, equipment suppliers, maintenance and construction services suppliers are the four major ones, but there may be more. Each one of these is as much a consultant as a supplier, but one word of caution: there are good and bad consultants just as there are good and bad suppliers for each situation.

FACILITY PLANNING

In our experience, the best plans for creating and operating a paint shop are developed by a small staff of multi-disciplined people utilizing a team approach. The team approach is based on two principles of operation. The first is that the company chooses the best people for their area of responsibility, and the second is that these people know how to interact and support the broader objectives of the team in order to create winning solutions.

Continuous improvement in the planning phase can be evaluated by time spent (shortening the lead time and execution time), budget cost reductions from project to project (creating common, repetitive material, process, and equipment solutions can increase paint shop life cycle cost savings), the satisfaction of suppliers participating on the project and the attractiveness of future projects.

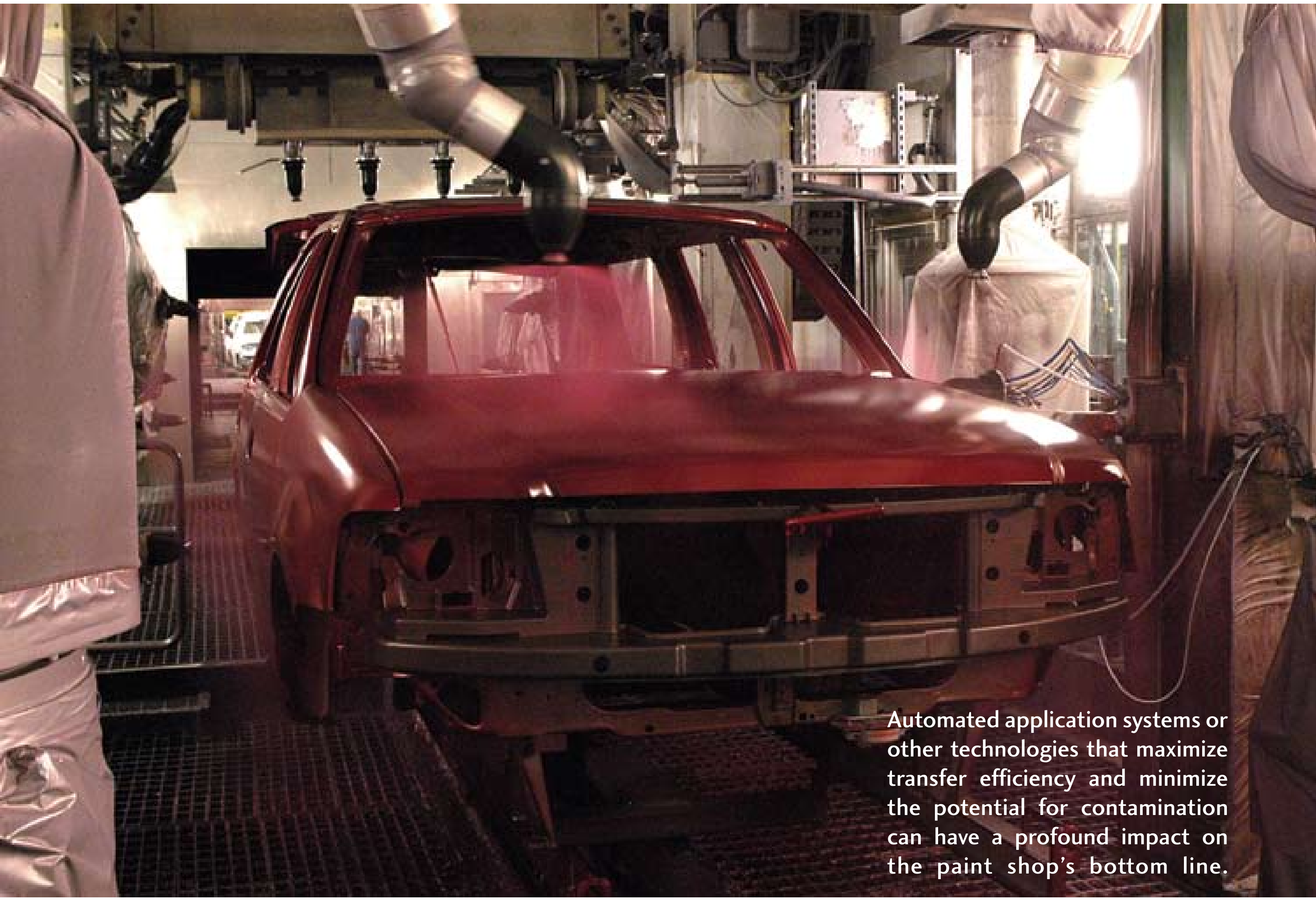
One of the greatest driving forces of design is the paint material chosen for the paint shop—waterbased, powder, solvent systems, catalyzed or multicomponent to name a few. Today, it is not unusual to have a paint shop operating with all of these material technologies present; for example powder primers, waterbased base coat and tinted or two-component clearcoat.

Also of great importance is the design of spraying and curing zones. The development of flexible automation, along with the current emphasis on reducing equipment size and content, especially in the spray area, has caused a change in equipment, spray and cure zone designs.

Unfortunately, during the past 20 years it has not been unusual to have paint shops force-fit new material or application technologies into a paint shop designed for a different generation of coatings or equipment. This has created a legacy of low-efficiency, high-maintenance systems with less-than-optimal quality—not to mention a great deal of frustration.

During this same time span, a significant amount of capital has been spent on the capture and destruction of air contamination and waste streams from the painting process. Ironically, during the 1980s and early '90s, environmental mandates forced paint shops to spend as much as 90% of their capital budgets on treating waste and only 10% on increasing application or curing efficiency. By consolidating the total capital outlay for a new paint shop and having it administered by a skilled team, the user will get a paint shop that has balance in labor, maintenance and compliance budgets based on global competitive benchmarks.

All members of the design team must be current on global best practices and benchmarks. They must fight for implementation of technologies and equipment that advance their company's competitiveness and do not hinder or burden them with extraneous process steps, equipment or labor expense. Time should be formally budgeted for the design and specification-writing group to routinely conduct benchmarking



Automated application systems or other technologies that maximize transfer efficiency and minimize the potential for contamination can have a profound impact on the paint shop's bottom line.

against competitors throughout the world.

FACILITY CONSTRUCTION

To fully capitalize on the skills and abilities of the design team, the supplier group should also contain members skilled and experienced in paint shop construction.

When visiting a build site for a paint shop, whether new construction or modernization, the first consideration is safety. Most sites have formal training and full time monitors for safety compliance. This program is driven by the job site construction manager.

The challenge for the future is to provide as much training and compliance monitoring for the construction detail of the facilities and proper equipment installation as for job site safety compliance. More effort by construction managers at the job site to ensure proper installation of all paint shop facilities and equipment would pay off; in fact, we believe installation training and compliance monitoring should outstrip safety training and compliance efforts by three to one because there is incredible payoff over the 20-25 year life of the paint shop.

Consider, for example, one improperly placed pipe fitting in a paint circulation system that generates agglomerated paint. The paint breaks free once a day, creating a dirt defect on one job per day. Considering a $160 average repair cost 250 days per year for 20 years, that one mistake will result in more than $800,000 of unnecessary repair over the 20-year life of the shop paint circulation system.

Once again, benchmarking best construction practices and best practices for the certification of systems for use (such as pressure testing field-installed piping systems) is critical to the competitiveness and cost of installed systems. Some of these subsystems have well-established and mandated safety checkout procedures due to the inherent danger of improper use (such as gas-fired burners).

Unfortunately, some have migrated to semi-formal certification procedures that slows construction and adds tens of thousands to hundreds of thousands of dollars to the system cost. An example of this is the adoption of ASME Pressure Testing of closed piping systems for the paint circulation system, and most importantly, the adoption of the test fluid media with a specific gravity of less than 1 and a viscosity similar to water or alcohol.

In reality, the paint that will flow though the piping system has a specific gravity of 1.25 to 1.4 and a viscosity of 80 to >200 plus centipoise. These heavier, more viscous materials will not seep or leak in the thousands of connection points like the deionized water or amine test materials. Too often, we are caught in the way we have done things in the past instead of the way we must do them in the future to be competitive.

FACILITY START-UP/RAMP-UP

By far the greatest issue that occurs during this phase is the removal of unexpected bottlenecks within the production process. Using experienced and trusted suppliers from earlier successful construction projects brings intrinsic experience to all participants. In addition, detailed log books of start-up problems with previous systems can provide rich sources of information for staff members performing on different shifts or in different locations.

Clearly specified landmarks of completion, with clear metrics (such as 20 hr of run time with no faults on robot stations/systems or 100 hr of proper circulation rates and paint temperature of a paint delivery system) must be specified up front to facilitate the handoff from the supplier to the user. While no one can predict all possible scenarios of failure or service, using the same team of people for successive projects can provide ample opportunities to refine these landmarks of completion. Again, it is important to capture the experiences and knowledge gained from earlier experiences and communicate them from job site to job site.

Over the past 20 years, the paint shop manager's job has evolved from watching personnel to continuously monitoring materials consumption and waste stream management.

It is during this phase of a paint shop's life cycle that there is the greatest amount of interaction between the supplier(s) and the user. Product and process engineers are called to the job site to monitor the acceptability and productivity of their designs and eliminate product- and process-based problems and bottlenecks, so it's not unusual for the user's participation to increase threefold from the original facility planning and construction staff.

With this increase in participation comes additional and sometimes conflicting objectives within the user ranks: making pre-production parts or vehicles, testing and calibrating key process equipment and training operations personnel are just three examples. Clear definition of user priorities and prominently posted hours of access for each area of responsibility (constructors, product engineers, and process engineers) during this phase will increase efficiency.

Certainly, emergencies and unanticipated tasks and events occur during this phase, but usually they will decline in frequency as the team progresses from job site to job site using common equipment, procedures and processes. However, having a readily available site manager during start-up to arbitrate conflicts during this phase will increase speed and efficiency by eliminating human and organizational bottlenecks, which can be as much as 50% of the total start-up bottlenecks.

FACILITY OPERATION

This phase is the pay-off period of a well-planned, correctly built facility, and it is in place for 85-95% of the paint shop's total life. It also represents 85-95% of the total life cycle cost of operating the paint shop.

Up until 15-20 years ago, automotive paint shop users (OEMs) were organized with a big division between direct labor and indirect (maintenance) labor cost. Luckily, the transition to managing all paint shop activities under one team has prevailed and strengthened in the last 15 years, and the paint shops of today are under greater control than those of decades past.

Twenty years ago, the emphasis was on getting the best looking job to the trim shop, and the focus was on the mood and demeanor of your paint sprayers and a few maintenance key personnel watching your PLCs or oven zone temperature controllers. Control was largely direct labor and materials monitoring and managing.

Today's paint shop manager needs a skill set completely different from the paint shop superintendent of 20 years ago. While the manager still watches the mood and demeanor of his spray zone engineers and technicians at the control stations, consumption of materials, waste stream management and consistent mirror like finishes on every part are the daily job, and driving costs down by 5-8% are the annual tasks.

Service providers for the paint shop, including the user's purchasing department, must remember the unique requirements of the paint shop when negotiating or procuring materials and consumables. Many times today, we encounter purchasing department initiatives to treat all consumables as a routine commodity to drive out cost. That is a very dangerous position to take for the paint shop.

A prime example is treating paint spraygun products as air tool commodities, which has been done frequently. A simple air or HVLP manual paint spraygun spraying just 250 cu cm (8 oz) per minute in a two-shift operation consumes $2,250,000 of paint per year (8 oz/min × 60 min/hr × 16 hours/day × 250 days/year × 1 gal/128 ounces × $150/gal = $2,250,000). Certainly, spray guns are the most expensive tools used in vehicle assembly, and the paint shop has 35-50 of these guns in constant use at manual and automatic stations during production hours. But spray guns are not commodities based on the cost of operation and the subsequent need for peak efficiency in their maintenance and use.

An estimated annual budget of a paint shop spraying passenger or small truck bodies might look like this:

- Amortized depreciation: $20,000,000 ($350,000,000 plus financing cost spread over 17-20 year life)
- Direct/indirect labor: $11,000,000 (100 direct/100 indirect at $55,000 per person)
- Maintenance, including spares, replacement and upgrades: $10,000,000 (spares/replacements/upgrades)
- Direct material (paint): $80,000,000

Given these numbers, it should be apparent where to focus your efforts to improve efficiency. Direct material accounts 67% of the operating cost in this model. All dimensions of direct material consumption must be scrutinized every day to keep cost creep out of the paint shop budget. Consumption of paint per color per job, applicator performance and service records, automation station reliability and the prevention of running in degrade modes, paint handling and mixing, amount of waste paint collected, and even solvent usage should be constantly monitored. Instrumentation must be calibrated, tested and monitored routinely.

These recommendations are based on the incredible payback that can be generated by paying close attention to paint consumption. A 1% incremental improvement generates $800,000 savings annually, and this can be done frequently with a refreshed look at the operating challenges in a paint shop, potentially multiple times per year until all shop employees understand the implications of a compromised or less-than-optimal solution. This is kaizen, and it takes a new level of resource commitment and teamwork from all participants—managers, laborers, in house service providers, and outside suppliers and contractors. PF

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LEARN MORE

A BAFFLING DEVELOPMENT

As this article points out, paint is the largest single budget item in most shops. To find out how one company reduced paint consumption and minimized generation of hazardous waste, read *A Baffling Development.*

Find the link to this article online at www.pfonline.com/articles/110602.html

For more information on paint shop systems and hardware from Hosco, phone 734-542-3343 or enter **PF *Direct*** Code **772ZT** at *www.pfonline.com.*

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