

ADVANCEMENTS IN PAINT SYSTEM DESIGN

Dominic Zerilli, Thierica Equipment Company

Abstract

The growing challenge for manufacturers to stay competitive and profitable has led to new advances in paint system design and service. The times of being able to dedicate a large system to one program or product is quickly becoming a thing of the past. Customer's needs are changing and paint systems are changing to suit. The flexibility to process parts with different geometries, materials, and application methods on one system has become a necessity. A new coating system designed specifically to address flexibility, modularity, and lead time reductions are the focus of these advancements.

Introduction

Traditional paint systems are designed for a specific high volume program or product line with little consideration for future process or product versatility. The capital cost justification is built into the piece price and the paint system may even be obsolete at the end of a program. The competitive nature of the plastics industry has forced suppliers to rethink manufacturing strategies and drive new concepts in paint systems.

The challenge for system suppliers is to provide value while creating an overall concept that is flexible enough to account for future products, materials, application methods, and process parameters. Since the market is shifting to smaller volume programs with greater complexity the system must accommodate seamless product or material changeovers and allow for capacity and capital equipment investment to be implemented incrementally. This leaner approach to system design means that multiple machines may ultimately be required but the smaller footprint, investment, and common design contribute directly to company's ability to quickly react to an ever changing market place.

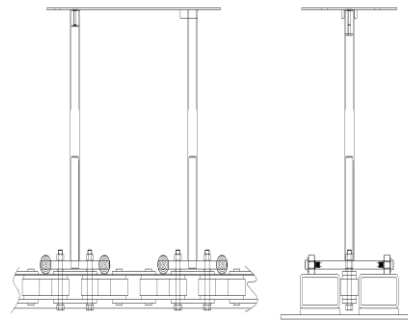
The specific initiatives that contribute to a new paint system design include:

- Part – orientation, presentation, and envelope
- Material – formulation, application, and process
- Production – capacity, capability, quality
- Facility – location, space, experience
- Company – budget, timing, strategy

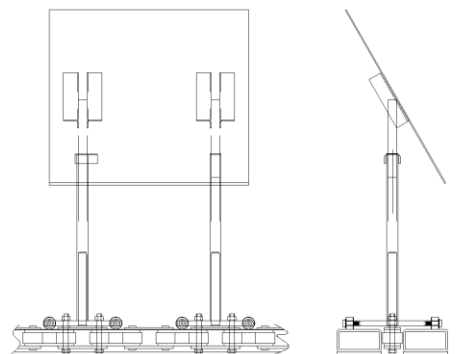
Part Geometry

The first consideration is the plastic parts size, weight, balance and designated coating area. Each part must be oriented for optimum paint coverage based on the part geometry. The part may need to be presented vertically or horizontal for paint application. It may need to be tooled in groups on a single plane, back to back, or even a circular pattern could be the optimum arrangement. In any case it is important to orient the parts in a way that achieves the best paint results instead of making them conform to an existing paint system arrangement. Instead the paint system must have the ability to adapt to the part.

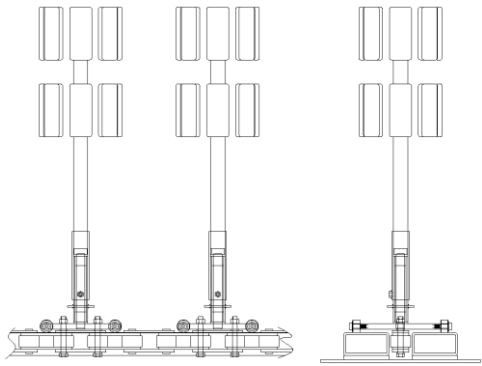
Determining the conveyor design becomes the driving force when considering large variation in part geometries and presentation methods. Since robotic paint application methods are widely used the flexibility of the applicator is no longer the determining factor. Below are examples of a Thierica manufactured conveyor design that can accommodate a wide range of part geometries and presentation methods.



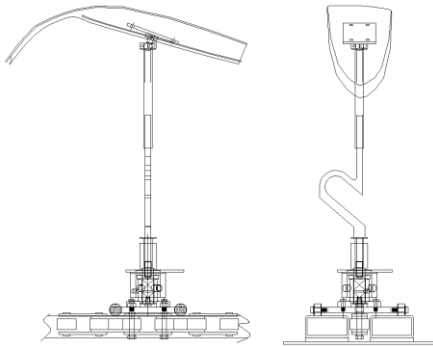
Horizontal fixed part presentation



Vertical fixed part presentation



Spinning part presentation



Indexing part presentation

The conveyor design can accommodate all of these orientations and application methods while providing a quick change tooling feature that allows for change over on the fly. Cleanliness has also been considered, by keeping all mechanical mechanism below the spray zone to meet class “A” surface requirements.

Paint Material Diversity

Increased demands of coating performance, new styling trends, and environmental concerns have forced coating suppliers to launch new products to adapt. The variation of these products and application methods are vast; whether solvent or water based 1K or 2 K, UV or thermal. Accommodations have to be made to the paint system design to utilize these coatings without cross contamination or unnecessary waste from change over.

The use of independent applicators on non compatible coatings in the same application area eliminate the fear of cross contamination and do not require flushes each time a material is used. Each material is live for use upon request

and the supply equipment is exclusive to a particular material. The issue then becomes how to manage multiple applicators within a single application zone.

The combination of two existing proven technologies, six axis paint robots and automated tool changes have made the use of independent applicators feasible. Below is an example of a Thierica system that utilizes a 1K liquid coating, a powder coating, and a media spreader within one application area.



A further advantage of the independent applicators is off line color change. When one applicator is being used the other applicator is placed into a purge unit where a color change is performed independent of the current job. No production loss due to long purge cycles. Just place one applicator and pick up another, typically a 5 second cycle.

Production Requirements

The question of what volume to plan for is always debatable. Do you design a paint system for immediate capacity requirements? Do you design a paint system for future capacity requirements? Do you build a paint system to get the business? Or do you build a paint system after you have the business? Most companies just want to invest in a system that operates efficiently at varying production volume because that is one thing that everyone can agree on, production volumes will almost never be predictable or constant.

Incremental capacity seems to fit the bill. Multiple low volume paint systems as apposed to one large high volume paint system have many advantages that go beyond simply capacity matching. Some of the advantages are listed below:

- Reduces floor space requirements
- Reduced lead time
- Lower capital investment
- Common design
- Lean work cell style concept
- No downtime required to expand capacity
- Ease of mobility to relocate capacity as needed
- Operator training applies to multiple facilities

Thierica has been building incremental capacity systems for clients around the world. Each design is unique to every project however common world wide to one customer. Below is an example of a modular paint system design with integrated air handling unit and PC based controls package.



Global Market Demands

With the globalization of markets and companies strategically purchasing or selling off all or parts of their businesses it is hard to determine who the players are at any one time. The assets of these companies including the paint systems are continually changing hands. This combined with the fact that there is a general abundance of paint capacity; systems don't stay in one spot anymore. This consideration has become a very important part of paint system design.

The equipment must be robust enough to be moved without damage, modular enough to be moved in sections

instead of pieces, wired and piped with couplers on each module, and sized to fit into a container for shipment over seas. Without these considerations many systems will be sent to scrap yards instead of being productive assets for the life of the technology.

Modular paint systems can be set up at the manufactures site for a complete production trail before ever seeing the actual production floor. The risk reduction and training advantages that this process creates is a benefit to all parties involved and should be a requirement for any new paint system purchase. Since the system is designed to be relocated out of the box, moving capacity form one location to another is quick and easy. Being swift and nimble with company wide paint capacity saves money and provides confidence during a production launch.

Conclusion

The environment in which we all work in is changing rapidly. Adapting to these changes is what ensures our survival. When designing a new paint system take into consideration the changing market and apply the technologies available to maintain profitability. To say that a paint system must be flexible is not enough. The definition of that flexibility is specific to each company and should be identified before the design begins. Then the advancements in paint system design can be applied to provide a solution that is appropriate for your business needs.

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