# *NASCAR Racing:*
# *A Model for Equipment Reliability & Teamwork*

by
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***NASCAR*** auto racing is the fastest growing spectator's sport in the United States. Whether at trackside, on television or radio, men, women, and children of all ages follow their favorite drivers and teams . . . and spend millions and millions of dollars along the way. Winning teams prepare winning cars. Winning cars attract advertising sponsorships in the form of big dollars. Sponsors invest their advertising budgets in winning cars that give them maximum balanced exposure to their customers.

The teams that fail to win races also fail to command the sponsors advertising dollars. After all, sponsors are the paying customers. And paying customers want maximum value for their purchasing dollar. Maximum value comes from displaying their advertising message, at or near, the front of the pack during the race and at the end of the race. It's called market exposure.

Have you ever wondered how thousands of moving parts can run at the outer limits of their design capability for 500 miles. Well, the secret is not necessarily "high technology" or big budgets. Its people — how they work with each other and with their equipment is fundamental to world-class levels of equipment reliability and performance. Modern auto racing illustrates many techniques that can help revolutionize today's manufacturing and maintenance operations. It's all about preparing to win . . .

Take a break from the traditional approaches to "benchmarking" and look outside the box for ways to improve the effectiveness of our equipment and the performance of our work groups. Look for methods that will improve the performance of your maintenance organization and learn about *world-class simplicity*, *focus on results*, and *doing the basics better than your competition.*

Let's explore the winning aspects of NASCAR Winston Cup race teams by looking at ***six key elements of equipment performance and reliability*** **for** manufacturing equipment and facilities maintenance. These six key elements are:

1. **Improving equipment effectiveness by targeting the major causes of poor performance**
2. **Involving operators in routine maintenance of their equipment**
3. **Improving maintenance efficiency and effectiveness**
4. **Improving skills and knowledge**
5. **Designing for operability and maintainability**
6. **Winning with teamwork focused on common goals**

## 1. Improving effectiveness by targeting the major causes of substandard performance

Making improvements to racecar performance is accomplished by focusing on results. Yes, ***results!*** Not the activity or improvement process in the hopes that results will happen. Race team members identify the critical performance indicators and continually measure, record, and analyze data as the basis for eliminating the causes of poor performance. This "focus-on-results" approach allows immediate feedback to the teams on the effectiveness of their changes.


Fast, easy, accurate data collection and analysis for every critical aspect of the business is of key importance. Race teams typically measure the following:

- **Racecar performance**: Track testing, wind tunnel aerodynamics testing, practice speed and handling, qualifying lap times, race lap times, and fuel mileage
- **Component performance**: Engines, transmissions, rear ends, steering gears, suspensions
- **Supplier performance**: Purchased items such as lubricants, pistons, crankshafts, gauges, ignition equipment
- **Tools and special equipment performance**: Hand tools, inspection templates, air wrenches, hydraulic jacks
- **Team performance**: Daily schedules, pit stop times, consistency, communications
- **Individual performance**: Applied skills and knowledge in each critical job responsibility, communications, team fit

Brian Whitesell, Team Engineer at Hendrick Motorsports describes the importance of maintaining critical data on each racecar: "*This book contains mileage sheets. When the car is tested, practiced, whenever the car takes a lap anywhere we have a record of what components were in it and how many laps and that can be transferred into miles on that car and on those components*."

## 2. Involving operators in routine maintenance of their equipment

High-performance cars and low-performance drivers very rarely win races, let alone championships. The driver (operator) is the critical link to making a high-performing racecar perform at its best. The driver not only drives the car in a competitive, safe manner but also is responsible for communicating the changing conditions of the car's handling and performance to the crew. Communications between

drivers and crews must be timely, accurate, and consistent, especially focused on the right things to systematically eliminate the major causes of poor performance.

Equipment ownership is an important part of the operator's responsibility. Jeff Gordon, driver of the number 24 DuPont Monte Carlo for Hendrick Motorsports stated that "*another part of my job is making sure I'm comfortable in the car. That driver compartment is basically mine. I own that. But they have to modify that to make sure that I'm going to be in that car for hours and not have any cramps . . .Any kind of fatigue or soreness is going to relate to my performance. So, we make sure that all the gauges are right there where I can see them at all times, Steering wheel position, seat position. That's my area*."

The role of the driver/operator typically includes the following:

- **Equipment inspection**: Listening, listening, feeling, tire management
- **Adjustment**: Driving style, braking technique, in and out of pit stop strategy
- **Correction**: Switching ignition systems, fire extinguishers, problem solving attempts and feedback
- **Communications**: With the crew chief, team members, chassis builders

Jeff Gordon clarified his role while driving the racecar: "*Really, my job to communicate is probably the most important thing. Because what I've got to do is send a message from the race car and the race track back to the team so that they can make the proper adjustments*."

## 3. Improving maintenance efficiency and effectiveness

Improving maintenance efficiency and effectiveness is necessary to systematically eliminate the major causes of poor performance. Efficiency is doing things right. Effectiveness is doing the right things. Maintaining racecars and the related tools and equipment to continually perform at their best, first time, every time, is crucial to competing at world-class levels.

Improving maintenance efficiency and effectiveness includes the following:

- **Preventive maintenance**: Visual inspections, proactive replacements, adjustments, lubrication, tire wear monitoring
- **Predictive maintenance**: Vibration and oil analysis; infrared, magnetic-particle, bore scope inspections, engine dynamometer testing
- **Equipment documentation**: Chassis as-built specs; engine, transmission, rear end, steering gear, shock absorber maintenance, run history, and modifications
- **Checklists**: Post race maintenance, pre-race checklist, pit cart checklist, race weekend supplies, and qualifying checklists assure consistency and seamless communications about the critical elements of preparing to win.
- **Spare parts**: Racecar parts inspected **before** being put on the shelf (acceptance testing), planned purchases to avoid costly express shipping and excessive inventory levels, consistent and reliable suppliers
- **Special tools and equipment**: Shop tools and equipment fit for use
- **Parts Carts**: Each car is numbered and has a corresponding parts cart to prevent mixing parts for the different cars in the shop
- **Pit stops**: Planned maintenance downtime for the racecar including fuel, tires, chassis adjustments, air intake cleaning, windshield cleaning, other adjustments, corrective maintenance, driver anti-fatigue break

Brian Whitesell, describes the importance of maintaining historical data on each racecar: "*This book contains the sheets of how the car is right now. The components… every major component that affects its performance we have a record of it. Each one of those components is identified with its own part number so that we can keep track of that. Build information, how the car was built in the R&D shop how the chassis was constructed, reference numbers, reference points, reference dimensions, so that we know where it stands relative to the other vehicles."*

## 4. Improving skills and knowledge of everyone involved

The skills and knowledge of every member of the race team is crucial to getting the right things done in the right way, first time, every time. Team members bring years of experience but they also need to learn new methods that suit the needs of the team and continuous improvement of their high-performing equipment.

Examples of focal points of improving skills and knowledge within the race team includes:

- **Individual team member**: Communications, shop procedures,
- **Teamwork**: Team meeting, brainstorming, problem solving
- **Leadership**: Decisive, focused leadership; motivation; problem solving; technical expertise
- **Pit crew**: Analyzing pit stops, improving technique, consistency and speed, physical conditioning, practice to perfect and refine performance
- **Driver/operator**: Driving skills, physical conditioning, mental conditioning, equipment and component knowledge, track knowledge, racing ability, communications, problem solving, public relations

Ray Evernham, Crew Chief and Team Manager for Hendrick Motorsports' DuPont car described it best when he said: "*We're all spark plugs. If one doesn't fire just right we can't win the race. So, no matter whether you are the guy that's doing the fabricating or changing tires on Sundays and that's the only job responsibility you have, If you don't do your job then we're not going to win. And, no one is more or less important than you are.*"

## 5. Designing for operability and maintainability

Not too long ago pit stops took nearly one minute. In the 1950's routine pit stops could take up to four minutes. Today

in NASCAR Winston Cup racing it is common to see routine pit stops completed in less than 20 seconds. A large part of this improvement is due to modifications that the teams made to their cars and equipment – modifications that in effect make the cars easier to maintain in shorter periods of downtime. Wheel hubs, studs, and lug nuts have been modified for quicker changeover. Fuel can valves have been modified to allow the fuel to run into the tank faster. Why is this important? Track position can be gained much easier by efficient pit stops that trying to pass cars on the track.

- **Modifications that extend the life of components on the racecar** - air ducts to cool the brakes, oil coolers to maintain proper oil temperature.

- **Making racecars easier to drive**: Gauges located within the line of sight and rotated so the critical pressures, temperatures and RPMs at the 12 o'clock position.

- **Controlling the weight distribution on the car**: Bolts not extending beyond a nut by more than one thread. This keeps the weight, ounce by ounce, from adding up all over the racecar so the teams can add weight in the lower left frame rail to maintain the lowest possible center of gravity.

  Paint and decals also add weight on the car. A typical paint job on some racecars weighs 18 to 30 pounds. Teams search for ways to reduce the amount of paint on the higher surfaces to help keep the center of gravity low. What now takes three to four days may soon be done in six to eight hours with a new process that uses computer-generated vinyl sheets with color schemes and sponsor decals. This can save precious labor hours, time in the shop, and reduce the weight of a coat of paint by 10 to 15 pounds.

Eddie Dickerson, Hendrick Motorsports Chassis Shop Manager talks about **continuous improvement** in auto racing: "*This business is very competitive. With 40 other teams out there, ten years ago there were five teams who could win the race, and there are 25 cars at least there now who could win the race. So, you try to stay on top, you can't take a step backwards, or stand still. The cars we have now are doing a good job. But we know that if we stop for any given time, the competitive nature of the beast here, they're going to get us.*"

### 6. Winning with teamwork focused on common goals

Even with all of the emphasis on high-performing equipment the best racecar cannot consistently perform well without teamwork focused on common goals using common processes for accomplishing their tasks. "Team" is a four-letter word that is often misunderstood. Teamwork is brought to consistently high levels in the world of auto racing.

Jeff Gordon said it best – "*The only way I can do my job correctly, is to be totally clear in my mind and have 100 percent confidence in every person's job that went into this team so that they can have 100 percent confidence in what I'm doing as a driver.*"

Some of the characteristics of teamwork observed in Winston Cup racing include:

- **Common goals**: Daily plans and schedules, weekly plans and schedules, race objectives

- **Common processes**: Daily morning meetings, Tuesday evening post-race meetings, pit crew practice sessions, checklists for each car

- **Regular feedback**: Daily discussions about the prior day's accomplishments, immediate feedback on the performance of the car and the team's efforts every time the car takes a lap and finishes a race

- **Rewards and recognition**: Team members sharing in the winnings and awards, congratulatory messages and tokens of appreciation after each race, sponsor recognition of team, media appearances

- **Focused leadership**: Leaders provide common focus for the team, facilitating timely feedback on individual and collective performance, providing needed resources for accomplishing responsibilities, holding team and individuals accountable for assigned tasks, walking the talk, committed to openness and honesty, listening, listening, listening

- **Individual strengths**: Specialized skills and knowledge respected within the team and continually improved in "multi-skill" job roles

- **Ownership**: A sense of team ownership for everything they do rather that singling out an individual – "*we won the race, we hit the wall, we had a tire problem, we missed the setup for the track, we nailed that pit stop.*"

Teamwork focused on common goals means regularly communicating the critical measures of performance and asking, among other questions . . .

- Where are we now?
- How did we get here?
- Where do we want to go?
- How should we get there? Who should be involved?
- How will we know when we get there?
- What will/should happen when we get there?

Race teams can improve only when they focus on common goals, track their actual performance, analyze the results, and take corrective action. They track and trend performance in qualifying position, laps led, race finish position throughout the season and comparing seasons to keep the entire team focused on common goals.

Regularly determining the root cause of both the poor performances and the **best** performances helps keep the teams focused on common goals, be they macro goals of winning the championship or the micro goals of finishing races in the top ten spots. The best race teams not only ask why they finished poorly but also why they won. They strive to avoid repeating the same mistakes or having the same problems AND they

attempt to repeat the race winning setups and practices. **Their goals are accomplished by establishing a foundation of consistent equipment performance and reliability.** This is the same foundation required in business and industry that relies on equipment to produce revenues.

Engaging the entire team in focusing on the common goal and giving their very best job performance is also important. The role of "leadership" is most critical in making sure the individuals and the entire team is capable of focusing on and achieving the common goals.

Rick Hendrick, III, Owner of Hendrick Motorsports talks about his team members:
"*I have a philosophy: If I've got an 80 percent guy he might not be the best guy in the business in the job he's doing. But if he's giving me a hundred percent of what he's got I'd rather have 100 percent of that 80 percent guy than 80 percent of a 100 percent guy. Because I've got commitment from this person that he's working hard to do the job, that he's part of the team. And I want them to know that I'm not any more important than they are. We are going to win or lose together and that's the way this company's built.*"

### Summary – Preparing to win!

Auto racing can provide many examples of ways to improve performance and reliability of the equipment and facilities we deal with day in and day out. The key point is how all of the activities, all of the methods, all of the race team's efforts are focused on RESULTS. By using data accumulated from every critical aspect of their work and the equipment performance the race teams are able to make very specific improvements.

Regardless, whether in high-stakes NASCAR Winston Cup racing or manufacturing equipment and facilities maintenance, high-performing equipment needs high-performing work groups with high-performing leadership to win races. In each case the six key elements of equipment performance and reliability.

Now, which of these methods used in auto racing can improve the performance of your maintenance organization through *world-class simplicity*, *focus on results*, and *doing the basics better than your competition?*

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