Delivering Operational Excellence to the Global Market

A DuPont Integrated Systems Approach
## Contents

EXECUTIVE SUMMARY ........................................................................................................... 1  
OPERATIONAL EXCELLENCE OVERVIEW .......................................................................... 2  
THE DUPONT APPROACH TO OPERATIONAL EXCELLENCE ............................................. 4  
ASSET PRODUCTIVITY ....................................................................................................... 6  
CAPITAL EFFECTIVENESS ............................................................................................... 9  
  Facilities Engineering Process ......................................................................................... 9  
OPERATIONS RISK MANAGEMENT ............................................................................... 12  
  Seven Elements of Operational Risk Management .......................................................... 14  
  Other Risk Management Consulting Expertise ............................................................... 16  
ENGAGEMENTS DESIGNED TO MEET YOUR OBJECTIVES .............................................. 18  
DUPONT’S UNIQUE QUALIFICATIONS ............................................................................ 19  
  A History of Sharing Expertise ......................................................................................... 19  
  Depth and Breadth of Expertise ...................................................................................... 20  
CASE STUDIES ................................................................................................................ 22  
  CASE STUDY 1 ........................................................................................................... 22  
  CASE STUDY 2 ........................................................................................................... 23  
  CASE STUDY 3 ........................................................................................................... 24  
  CASE STUDY 4 ........................................................................................................... 25  
CONCLUSION .................................................................................................................. 26
EXECUTIVE SUMMARY

In today’s competitive global marketplace, excellence is not an option; it is essential to success. For many businesses, the DuPont Operational Excellence (OE) model can be the key to global business competitiveness. This document describes our approach to helping our clients maximize their business results by applying DuPont expertise, technology, and process knowledge.

DuPont’s Operational Excellence model helps our clients apply best practices with respect to:

- **Asset Productivity**
- **Capital Effectiveness**
- **Operational Risk Management**

Our structured approach can bring to your organization the experience of a 200-year-old corporation that has operated thousands of different processes in hundreds of manufacturing locations in over eighty countries around the world. DuPont’s scientists and engineers have perhaps the broadest experience base of any consulting firm in the world in increasing the efficiency of manufacturing processes.

The following pages provide the information needed to take the first vital steps toward achieving Operational Excellence, including an outline of the process, specifics about DuPont areas of expertise, and detailed case studies showing how the process has worked for other organizations – and thus could work for you. The next step is up to your organization. We look forward to working with your team in making the journey to Operational Excellence.
Why is Operational Excellence so important to the success of your business in the global marketplace today? Here is what the experts say:

“Operations must become a, if not the, primary marketing tool in the firm’s arsenal. Quality, maintainability, responsiveness, flexibility and the length of the innovation cycle are controlled by the factory.”

(Tom Peters, *Thriving on Chaos*)

“Operations is more than the bricks-and-mortar decisions—the amount of production capacity, the kind of production equipment, and the location of the equipment. Management policies and systems determine HOW WELL the bricks and mortar perform and therefore HOW COMPETITIVE they are.”

(Robert H. Hayes, Seven C. Wheelwright, and Kim B. Clark, *Dynamic Manufacturing*)

Operational Excellence (OE) is an integrated management system developed by DuPont that drives business productivity by applying proven practices and procedures in three “foundation blocks”—**Asset Productivity, Capital Effectiveness**, and **Operations Risk Management**.

The OE management system gives a company the benefits of lower costs, increased efficiencies, fewer injuries, maximum sustainable returns on operating assets, and an enhanced competitive position.

Our integrated OE management system can be applied to existing facilities, new facilities, and facility expansions. OE gives an organization these advantages:

- Strategic clarity about your mission, objectives, and organizational expectations;
- A culture of Operational Excellence;
- Best practices in process architecture;
- A well-orchestrated improvement journey; and
- Superior organizational alignment and execution.

Taking the journey toward achieving Operational Excellence typically begins with making an initial **step-change improvement**, followed by a **continuum of incremental enhancements**. Installing a culture of Operational Excellence results in **significant and sustained competitive advantage**.
A study by the Board of Manufacturing and Engineering Design (formerly the Manufacturing Studies Board) of the U.S. National Research Council showed that companies that effectively implemented world-class manufacturing systems achieved tremendous improvements in asset productivity performance.¹

- Increase in product quality: 100–400%
- Increase in manufacturing productivity: 40–70% (quantity/person)
- Increase in manufacturing capacity: 15–25%
- Reduction in in-process inventory: 30–60%
- Reduction in overall product introduction time: 30–60%

At DuPont, we have experienced these levels of impressive, measurable results. The application of OE best practices has also given us outstanding performance in low-cost risk management (seven times better than the industry average²) and a 10- to 15-percent improvement³ in overall capital effectiveness.

³ As benchmarked by Independent Project Analysis (IPA).
THE DUPONT APPROACH TO OPERATIONAL EXCELLENCE

Because we believe that excellence among all is best for all, DuPont offers management-consulting and implementation services to help other companies achieve sustainable improvements in productivity. Both DuPont and our clients realize such results through our change-management process, which involves:

- Assessing a client against established benchmarks and best practices;
- Identifying areas for improvement with corresponding return on investment;
- Aligning the organization with the reason for change and a vision of the future state;
- Implementing appropriate processes and practices to realize the benefits; and
- Providing a continuous improvement framework for sustainability.

To help you achieve Operational Excellence, we combine the best management processes, globally recognized technologies and technologists, Six Sigma methodology, and a proven culture-change model to provide an integrated solution. Our consultants customize a client-specific approach that leads to sustainable competitive advantage. We facilitate the transfer of knowledge and capabilities by offering personal coaching and mentoring that ensures ongoing improvements. We don’t just identify problems and recommend solutions; we actively help our clients to fix what is broken and make the changes needed so it does not break again.

We recognize each client’s uniqueness, while providing a continuum of closed-loop, systematic approaches that range from strategic design to process technology. Clients gain immediate benefit by having access to our 200 years of manufacturing experience and expertise in Operational Excellence, 100 years of engineering innovation and systems integration, and more than 30 years of experience in providing consulting and training services through our DuPont Safety Resources (DSR) business.

Our seamless transfer of knowledge and side-by-side implementation assistance maximizes results in the shortest time. Our professional staff brings decades of operational experience in a multitude of industries. Their expertise in providing program analysis and consulting services for public and private entities was developed through hand-on improvement of DuPont’s manufacturing operations – a unique qualification that lets us help clients achieve similar results.
Our Operational Excellence system of service is based on the following three foundation blocks:

- **Asset Productivity**
- **Capital Effectiveness**
- **Operations Risk Management**

Each of these foundation blocks contains a number of specific management system elements – 21 in all – that we apply to each client’s situation as necessary. The three foundation blocks are described in detail on the following pages.

We can perform at multiple levels – from very concise to very broad, with a range of services as basic or detailed as required. Using multi-component analysis, we identify gaps in operations strategy, deployment, and execution.

We then develop a business case for improvement. This becomes the platform for launching improvement teams under the guidance of subject-matter experts, and leads to the development of a plan for sustaining the gains and continuous improvement.
ASSET PRODUCTIVITY

Asset Productivity is a process for extracting the maximum value from a manufacturing asset base (people, materials, and investment), resulting in increased cost productivity.

Our clients increase their asset efficiencies and realize increased profitability through our proven change processes and by implementing our world-class work-management processes, results-oriented key-performance indicators, and industry-recognized best practices/standards.

These Asset Productivity continuous-improvement processes have given DuPont a visible competitive advantage – a 3% to 5% yearly increase in cost productivity globally over the past 10 years.

To ensure sustainable results, we treat each client engagement as a project. The DuPont Asset Productivity delivery model is a five-step process with a methodology aligned with both Six Sigma and the DuPont Capital Process:

1. Business Level Analysis – understand “what” is happening (GAP analysis).
2. Assessment – discover “why” things are the way they are (begin the change process).
3. Consensus/Implementation Planning – develop “how” to make a change/impact (chartering for action).
4. Implementation – put the plan into action (realization).
5. Sustaining/Control Plan – keep the gains (build on success).

As a practice, Asset Productivity is divided into six elements that instill the discipline necessary for improving and sustaining manufacturing competitiveness.

1. Maintenance and Reliability Systems – An integration of functional disciplines combining technology, work-management systems, and change processes, applied in a systematic way, to lower unit maintenance costs by 10% to 20%, by finding and resolving the root causes of unacceptable process reliability and poor equipment performance.

Examples of delivery components:
- Work-managing Processes
- Managing Storeroom (MRO) Supplies Effectively
- Reliability-Focused Maintenance
- UPbase® Uptime Measurement Software
- Preventive/Predictive Maintenance Strategies
2. **Manufacturing Capacity** – A process focused on improving operations by 15% to 25% through increased throughput, cycle-time reduction, eliminating bottlenecks, and improving work flow by modeling and analysis capabilities.

*Examples of delivery components:*
- Material and Product Flow Analysis (MSA)
- Continuous Flow Manufacturing (CFM/LEAN)
- Industrial Ergonomics
- Warehouse/Distribution Analysis
- Manufacturing Systems Simulation/Visualization

3. **Energy Optimization** – Improving energy efficiency, safety, reliability, cost, and operability for the current fixed asset base by applying superior technology, creating typical savings of 2% to 3% savings in six months and 10% within two or three years. Sustainability evolves from applying best practices, audits, and transferred knowledge, resulting in reducing the infrastructure “footprint” and liberating funds for other mission-critical initiatives.

*Examples of delivery components:*
- Steam/Dowtherm Generation
- Electrical Power Distribution
- Refrigeration
- Cooling Towers
- Heating, Ventilating, & Air Conditioning (HVAC)

4. **Facilities Infrastructure** – Re-establishing asset integrity to handle the constant pressures to increase earnings and reduce costs that can create a culture in which it becomes the normal practice to defer maintenance. The DuPont Infrastructure Maintenance Audit (IMA) Process creates a timely, systematic way to help minimize the maintenance costs associated with aging facilities.

*Examples of delivery components:*
- Groundwater Protection – trenches/sumps/dikes, tank foundations, sewers
- Structural Integrity and Architectural Components
- Transportation Systems – roads/pavements, railroads
- Power/General Services – PG&S equipment & systems, electrical power equipment & systems; HVAC equipment & systems, service piping
- Materials – coatings & linings, plastics & elastomers, insulation, fireproofing
- Life Safety Systems
5. Mechanical Integrity – A component of both Process Safety Management (PSM) and Risk Management Programs (RMP) that integrates technologies to create a program that focuses on regulatory compliance and on reducing emissions and failures. It is reliability-based and establishes a framework to rank mechanical-integrity activities.

Examples of delivery components:
- Materials of Construction Selection, Specification, and Fabrication
- Equipment and Piping Nondestructive Testing and Condition Assessment
- Maintenance and Reliability Predictive/Preventive Maintenance
- Process Safety Management


Examples of delivery components:
- Dynamic Simulation (TMODS™)
- Performance Surveyor™
- Lab Feedback Proportional Integral Controllers
- Process Operability Analysis
- Advanced Statistical Process Estimation and Control Tool (ASPECT)
- Six Sigma and Applied Statistics
- Quality Management
CAPITAL EFFECTIVENESS

DuPont has consistently demonstrated that Capital Effectiveness can reduce annual capital budget by 10% to 15%, or increase yield from an existing capital budget by 10% to 15%. We have developed a well-defined Facilities Engineering Process, identified the most critical steps in that process, created best practices to explain how to execute the critical steps, and developed assessment tools to measure how well those steps have been executed.

These processes and tools represent our cumulative know-how from 100 years of executing some of the most significant capital projects in the world. Based on the ratings of all Independent Project Analysis (IPA) performance parameters, DuPont is the benchmark for the industry and the acknowledged global leader in project management/execution.

During a client engagement, our experts first perform a detailed assessment of the client’s capital-management and execution process.

Next, using assessment results, we propose a capital-effectiveness improvement program that includes the following:

- Training in our Project Process Methodology, including how to apply/adapt this methodology to the client’s process.
- Training in how to be an effective Project Team Leader.
- Training in selecting and applying value-improving practices for cost and schedule effectiveness.
- Applying selected value-improving practices to actual client projects.
- Detailed review of more than 20 capital best practices, including generic templates that allow clients to develop their own set of best practices.
- Specific practices and techniques to help the owner representative manage design and construction contractors.
- Techniques for managing an overall capital program, including project prioritization, capital allocation, and budget control.

Finally, we help the client execute the capital-effectiveness improvement program and put sustaining processes and practices in place to realize a 10% to 15% reduction or improved use of the client’s capital budget.

Facilities Engineering Process

The DuPont Facilities Engineering Process has eight elements:
1. **Business Planning** – Ensures that the business objectives are recorded, understood, and accepted by all who contribute to the project.
2. **Facility Planning** – Transforms business objectives into project objectives and a project capital budget.
3. **Project Planning** – Transforms project objectives into a production design basis and authorization estimate.
4. **Project Implementation** – Launches production design, procurement, and construction.
5. **Start-up and Initial Operations** – Begins plant commissioning, operations, and maintenance.
6. **Value-Improving Practices (VIPs)** – Uses applicable VIPs to improve cost, schedule, and operability.
7. **Contractor Effectiveness** – Identifies and completes contracted work for best value.
8. **Shutdown/Turnaround Practices** – Creates more effective shutdowns with longer intervals between shutdowns, while increasing Uptime.

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**DuPont Facilities Engineering Process**

We have developed additional capital-effectiveness tools in our Facilities Engineering Process, including:

- Project gate-keeping methodology.
- “No change” project execution.
- Readiness-to-operate validation.
The benefits of our Facilities Engineering Process include:

- Best practices for business, facility, and project planning in the industry, resulting in firm scope of work for projects.
- Controlled project cost (to +/−10%).
- Experience of a benchmarked leader in capital project execution.
OPERATIONS RISK MANAGEMENT

Understanding and controlling risks can provide substantial benefits to the well-being of a company’s employees, contractors, finances, and public image: fewer injuries, lower emissions, and reduced claims expenditures. Conversely, failure to properly manage risks can have severe negative consequences.

We are uniquely qualified to offer consulting services in the area of risk management. As shown below, DuPont integrated systems have made us the leader in managing risk, with costs at seven times below industry averages.

Who Has the Lowest Cost of Managing Risk?

![Graph showing cost comparison]

Du Pont’s Performance is ~7x better than industry averages and ~3x better than chemical peer group

Source: 2001 RIMS Benchmark Survey, property damage & business interruption*

Our Operations Risk Management offering is an integrated management system that expands on our proven safety-management model to encompass process-safety management (PSM) and behavioral safety in the following seven elements:

1. Technology and Facility Safety Systems
2. Electrical
3. Fire and Explosion
4. Environmental  
5. Product Stewardship  
6. Distribution  
7. Occupational Health and Industrial Hygiene

We help clients implement sustainable continuous-improvement processes to manage risk in each of these elements through four main process areas: *assessing; envisioning and managing; planning;* and *implementation.*

**Continuous Improvement Cycle**

- **Assess:** Management audits (e.g. FELT leadership), 1st and 2nd party audits, leading and training metrics. 
  - A management responsibility to develop goals and objectives; approve KPI and COT.

- **Envision:** Analyze assessment data, track progress, and develop KPI and COT for management approval.

- **Plan:** Implements COT through the line organization; tracks progress and reports to management.

- **Implement:** Management responsibility to develop goals and objectives; approve KPI and COT.

*KPIs = Key performance indicators (e.g. metrics; FELT)  
COTs = Critical Operating Tasks  
FELT Leadership = from “feeling”; direct interaction between leadership and the entire organization (top to bottom)*

The process starts with assessments, audits, and metric analysis to understand the current state as compared to regulations, industry standards, corporate policy, improvement opportunities, and other key performance indicators (KPIs), based on client input. It then moves to developing management goals and objectives and defining the organizational roles and responsibilities to accomplish these.

We then help put systems in place to track and analyze performance and other metrics (KPIs), and to develop Critical Operating Tasks (COTs) based on these metrics, goals, and objectives. Management agrees to the COTs and their completion dates, and assigns responsibility for these to specific individuals.

We will train client resources, provide protocols, and assist with assessments, developing metrics and tracking systems, data analysis, prioritizing improvements, and implementing the COTs, which will address the full range of issues identified in the continuous-improvement process.
Seven Elements of Operational Risk Management

1. Technology and Facility Safety Systems – We put our world-class reputation for Safety/Health/Environment (SHE) expertise to use in developing management systems and processes for manufacturing facilities, office buildings, laboratories, infrastructure, and other facilities. These include organization, roles/responsibilities, standards/guidelines, processes/procedures, and tools. Our experts define what clients need to do, provide coaching in how to do it, and help implement to improve performance. The effort starts with an assessment to understand client systems and performance and develops recommendations for improvement.

Examples include:

- Process Hazards Analysis
- Standards and Guidelines
- Process Safety Management Implementation Assistance
- Continuous Improvement Process
- Management Commitment and Responsibility
- Facility Siting Studies
- Inherently Safer Processes
- Emergency Response Planning
- Integrated SHE Organization

2. Electrical – We have provided industry leadership to develop improved practices and procedures, including management systems, tools, training, and experience, to control the risk of electrical injuries at manufacturing sites, such as controlling electric-arc flash fires. We will assess your processes and systems and develop an improvement program.

Examples include:

- Electrical Safety Training and Consultation
- Incident Investigations
- Audits Using DuPont Protocols
- Electrical Safety Guidelines
- Short Circuit Studies
- Time/Current Coordination
- Arc-Flash Hazards

3. Fire and Explosion – The SHE management system provides the framework, processes, procedures, tools, and skills needed to understand the risks, identify improvement opportunities, and successfully manage the risks from fires and explosions. We help clients ensure that systems are in place to prevent, protect, and respond to fire and explosion events, using the state-of-the-art tools to identify key risks using process-hazard review and consequence analysis. We help you establish standards and guidelines; assess your systems, processes, and performance; and develop recommendations for improvement.
Examples include:

- Fire and Explosion Incident Investigation
- Fire and Explosion Modeling, Detection, and Suppression
- Fire Safety Audits
- Fire Safety Management Systems
- Fire Safety Training
- Life Safety
- Occupant Notification and Egress
- Emergency Preparedness and Response

4. Environmental – We also use the SHE management system to provide the framework for additional tools in identifying risks and developing solutions to environmental risks. This work uses the regulatory framework of the facility and addresses air, water, and solid-waste issues.

Examples include:

- Environmental Permitting
- Environmental Solutions
- Environmental Management System Assessment
- Air Dispersion Modeling
- Exposure/Risk Assessments
- Water-Quality Treatment
- Ground Contamination Remediation Planning
- Solid-Waste Management

5. Product Stewardship – We help our clients ensure that all involved understand the risks of products and manage them properly. This addresses key areas such as:

- Senior Management Support
- Internal Communications
- Product Review Systems
- Risk Characterizations and Risk Management
- Systems for Training and Refreshing R&D Systems
- Joint Ventures
- Sustainable Growth Initiatives
- Standards and Guidelines

6. Distribution – We help clients understand and manage distribution risks, to ensure that proper tools, practices, and training are in place for distributing hazardous materials. Key aspects include understanding and meeting regulatory requirements, ensuring a properly trained workforce, and inspecting and auditing facilities.

Examples include:

- Regulatory Training
- Standards and Guidelines
- Risk Assessments
- Carrier Safety
- Emergency Preparedness
7. Occupational Health and Industrial Hygiene – We will help our clients develop, document, and implement Occupational Health programs to protect people from the harmful effects of chemical, physical, and biological hazards, providing the systems and technology vital to identify and manage risks and assess performance.

Examples include:

- OH Injury and Illness Reporting, Classification, Investigation, and Documentation
- OH Roles, Responsibilities, and Accountabilities
- OH Records and Communication
- Metrics of OH Management
- OH Audit Protocols
- Medical Programs for Fitness Duty, Surveillance, and Emergency Care
- Effective Wellness Programs

We use a full range of techniques to help clients understand risks and develop effective mitigation measures. These include qualitative, semi-quantitative, and quantitative analyses using state-of-the-art proprietary and licensed tools.

We also offer access to a wide variety of training courses in topics such as fire protection, fire-safety management, electrical-safety management, biotech-safety and -security management, environmental-risk management, product-stewardship management systems, product liability, and ergonomics.

Other Risk Management Consulting Expertise

DuPont also provides consulting expertise in other risk-management areas:

**Supply Chain** – We help the supply-chain team identify and understand key vulnerabilities and concerns, using our expertise in modeling, alliances, and substitution to drive down cost. We help clients optimize inventory – amount and location – to balance storage costs, customer service, and public/environmental risk factors.

Examples include:

- Assessment and Benchmarking
- Simulation Software – Promodel®, iGraphics-Process®
- Optimization Tools – MIMI®
- SAP Supply Network Planning
**Crisis Management** – We provide the tools, training, and experience to help put the systems in place that you need to be prepared to respond at the corporate level when the unexpected happens – loss of manufacturing facilities, transportation incidents, environmental incidents, financial incidents, product-liability incidents, kidnappings, loss of key corporate officers, etc.

Examples include:

- *Assessment of Current Program*
- *Standards and Guidelines*
- *Development of Corporate Principles*
ENGAGEMENTS DESIGNED TO MEET YOUR OBJECTIVES

DuPont designs engagements to meet four client objectives in terms of operational costs – **whether there is a need to change, what the future will look like, a plan for change,** and **ways to secure and sustain the benefits of change.**

Our consulting approach provides the framework to perform any combination of these engagements. **Assess, Envision, Plan,** and **Implement** are sequential steps, while **Project Management** and **Communications** occur in parallel throughout the engagement.

- **Assessments** focus on characterizing the current state of the client’s operational excellence systems.
- **Envisioning** drives commitment by understanding a client’s willingness to embrace our approach.
- **Planning** focuses on tailoring the implementation model to the client.
- **Implementation** carries out the plan to secure the benefits the client seeks.
- **Project management** lets teams perform their work and track progress.
- **Communication** enables all involved to share techniques and ensures continued success over time.
DUPONT’S UNIQUE QUALIFICATIONS

A History of Sharing Expertise

As one of the oldest continuously operating industrial enterprises in the world, DuPont has unsurpassed experience in engineering processes, operational discipline, and safety performance. Our competitors and customers have long recognized our methodologies and technical resources as critical assets in creating the ideal foundation for a continuous improvement process of Operational Excellence.

Over the past 100 years, DuPont Engineering has given our preferred clients access to this wealth of knowledge/experience for their own competitive advantage. In the early 1970s, we began to make one segment of our Operational Excellence portfolio (safety) available to the public, in the form of training programs and consulting services. In response to customer requests, we gradually expanded that offering to include our expertise in contractor-safety management, ergonomics, and emergency response.

Customers also began to express a desire for access to other key elements of our Operational Excellence portfolio. When we began selling, licensing, and joint-venturing product/process technology, customers and clients increasingly recognized our competence in asset productivity, capital effectiveness, and operations risk management. The global market wanted what was behind the DuPont process-technology package because it produced competitive, profitable products while demonstrating environmental stewardship.

As practiced at 150 DuPont manufacturing sites in 70 countries – and now available to your organization as well – Operational Excellence has enabled a broad spectrum of industries to consistently outperform in their respective markets.

When exported outside DuPont – whether in mining operations from Australia to Canada to Colombia, public transportation systems in the United States, chemical facilities in Asia Pacific, petrochemical complexes in Latin America, or coating processes in India – our practices provide the sustainable, integrated solutions needed today.
Depth and Breadth of Expertise

The DuPont “brain trust” behind our systems and processes consists of 600 DuPont engineers and consultants representing the following engineering technologies:

Business, Investment, and Scheduling
- Estimating
- Cost Control
- Scheduling

Chemical/Process Engineering
- Heat, Mass, and Momentum Transfer
- Operations Research
- Particle Science
- Process Synthesis/Development
- Reaction Engineering
- Thermodynamics, Kinetics, and Mechanisms

Civil Engineering
- Infrastructure/Maintenance Assessments

Electrical and Instrumentation
- Control Systems
- Electrical Engineering
- Electrical Technology
- Instrument Engineering

Energy Engineering
- Energy Efficiency Audits
- Strategic Planning for Utilities (Risk-Based)
- Computer-Based Utilities Optimization
- Energy System Modeling
- Furnace and Fuel System Safety
- Combustion Technology and Control
- Refrigeration
- High Temperature Heat Transfer Systems
- Process, Laboratory, and Clean Room HVAC
- Indoor Air Quality

Facilities Construction and Support
- Contractor Safety
- Best Practices
- Pre-commissioning and Check-out
Industrial Engineering
  - Manufacturing Systems
  - Distribution

Mechanical Engineering
  - Engineering Mechanics
  - Maintenance Reliability Systems
  - Mechanical Systems
  - Process Equipment
  - Rotating Machinery

Materials Engineering
  - Materials Selection and Specifications
  - Nondestructive Evaluations
  - Corrosion and Wear Testing
  - Fitness for Service Evaluation
  - Equipment Physical Failure Analysis

Process Safety and Environmental
  - Environmental Engineering
  - Product Stewardship
  - Explosion Hazards Laboratory
  - Pollution Prevention
  - Lead/Asbestos Abatement
  - Hazard Remediation
  - Process Safety and Fire Protection
  - Occupational Health and Industrial Hygiene
  - Explosion Engineering

Project Management
  - Project Definition Leadership
  - Facilities Engineering Process
  - Procurement Processes
  - Best Practice Discipline
  - Project Implementation Excellence

Quality and Process Control
  - Process Control
  - Process Sensors and Analyzers
  - Quality Management and Technology
CASE STUDIES

The following case studies provide insights into how the DuPont Operational Excellence approach has helped client companies face, assess, and respond to challenges in the global marketplace that were undermining their ability to compete effectively. While these are by no means the only examples of our success in applying the OE principles to the challenges of our clients, they offer a clear sense of how we can help your organization achieve similar results.

CASE STUDY 1

Situation
PEMEX Gas (the national gas/petroleum company of Mexico) holds safety, health, and the environment (SHE) as top management priorities. In its first five years of work with DuPont, PEMEX achieved dramatic results in SHE performance, as well as significant savings. The injury-frequency rate (injuries per 1 million man-hours exposure) dropped from 4.86 in 1996 to 1.07 in 1997 and further to 0.60 in 2001. The company set new goals to enhance its economic value by creating a business culture of effective assets and defect elimination.

Solution
DuPont used the client’s excellent foundation in the SHE arenas to increase its asset effectiveness, in part by implementing and training in using UPbase®, software developed by DuPont to provide companies with detailed views of their manufacturing units. The software identifies where and when production losses occur so improvement efforts can be enacted effectively. The tool also utilizes operations, maintenance, engineering, and business personnel to share information between units, for integrated, sustained improvement processes.

Results/Client Benefits
- Reduced injuries by 92% in two years.
- Received recognition from the Mexican government for its accomplishments.
- Received Industria Limpia certification by SEMANART, Mexico’s most important government environmental-protection agency.
- Enhanced employee morale by actively and visibly involving management and staff in creating a safer, cleaner, and healthier work environment.
- Established action plans to improve asset effectiveness, reliability, and Uptime levels to greater than 90% by 2006.
NOTE: Because the following three case studies are client-confidential, client/company names are not shown.

CASE STUDY 2

Situation
A multibillion-dollar global specialty-fibers business, committed to improvement, faced the following conditions:

- Technology advantages no longer offset competition.
- Market prices were eroding.
- Manufacturing costs had to be reduced.
- Yields and quality required improvement.

Solution
DuPont applied the Operational Excellence approach to working with the client company in developing a long-range plan focused on engineering, technology, and operations. The client implemented these improved managing processes and systems within the context of the plan.

Results/Client Benefits
- First-pass yield (FPY) improved 15% over 10 years.
- New technology reduced capital ($/kg) by 70%.
- Conversion cost dropped 44% over 10 years.

![Graph showing FPY % from 1990 to 2000](image)
CASE STUDY 3

**Situation**
A particular plant within a chemical commodity business wished to reduce variable costs to improve its competitive position. Goals were to:
- Improve uptime from being the least reliable plant (~70%) to 90%.
- Maintain or improve SHE performance throughout the change process.

**Solution**
DuPont applied the Operational Excellence approach to enable a comprehensive improvement process, with elements that addressed work processes, applied technology, and site culture.

**Results/Client Benefits**
- Improved reliability >18% to 91.5%.
- Moved from ~70% to 90% uptime.
- Reduced annual variable cost by $14MM.
- Experienced no safety or environmental failures while implementing change.

![Yield Improvement Graph](chart.png)
CASE STUDY 4

Situation
An inorganic-chemical products business wished to reduce manufacturing to improve its competitive position. Specific goals were to:
- Improve Uptime rate from 76% to 82%.
- Improve maintenance and reliability (M&R) processes.

Solution
Using the Operational Excellence model, DuPont designed and helped install an integrated M&R improvement project that focused on establishing better work processes, upgrading systems, reducing costs, and improving reliability.

Results/Client Benefits
- Reduced M&R spending by 21% (>7MM/year).
- Reduced the number of contractors.
- Reduced downtime by 35% unscheduled and 9% scheduled.
- Reduced OT from 12.2% to 6.6%.
- Achieved project payback in less than one year.
CONCLUSION

Clearly, the DuPont Operational Excellence system approach yields significant improvements for our clients. We encourage your organization to become one of the current era’s cutting-edge, successful members of the global marketplace by incorporating our proven, results-oriented approach into your business planning and activities.

We welcome the opportunity to further expand the ranks of the world’s effective global organizations by sharing our expertise on your behalf.