Chapter 22: IONICS Process 5—Cultivate Huge Chance of Process Success

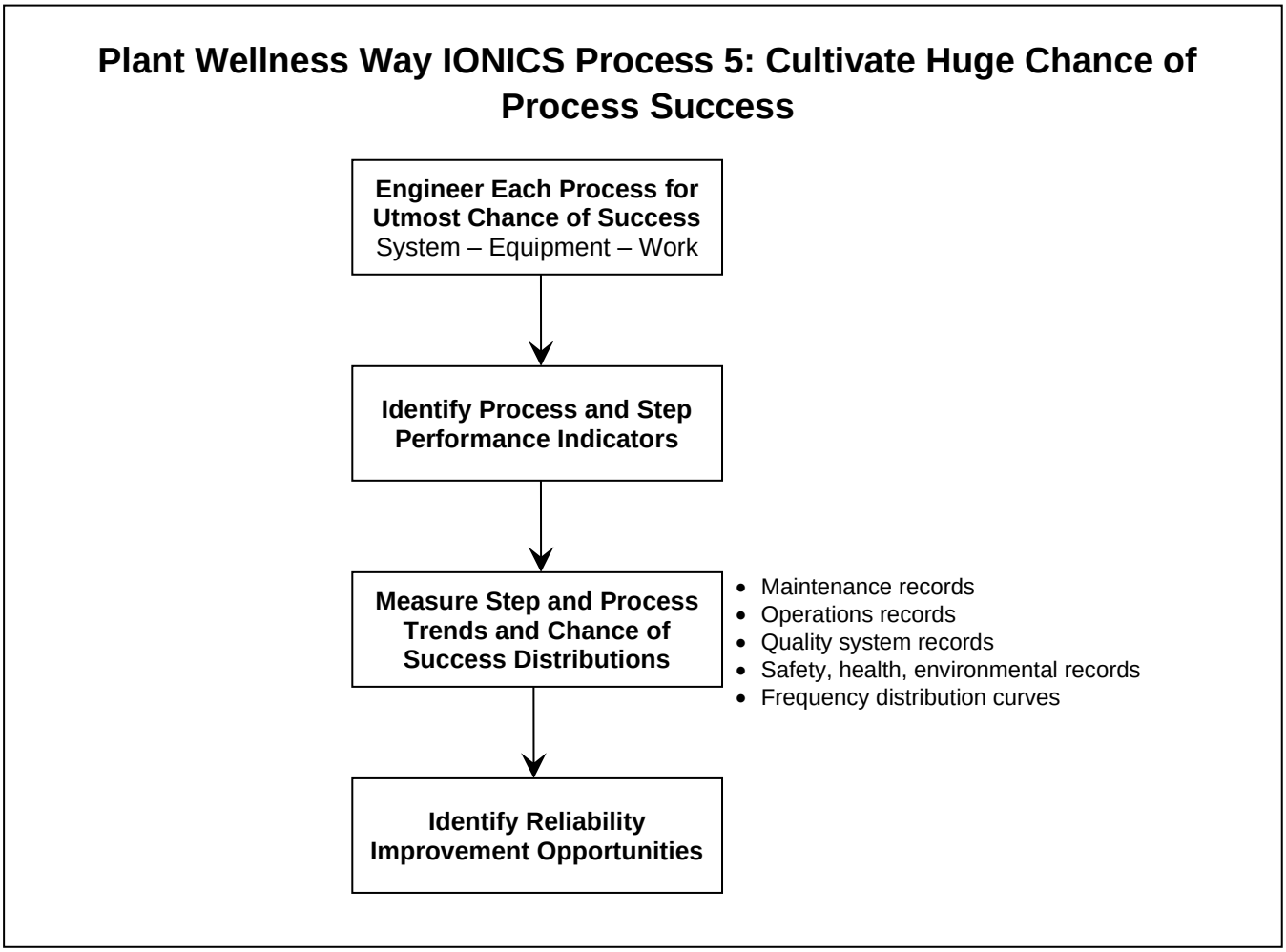


Figure 22.1–IONICS Process 5 Steps

Summary Description of Process 5: Risk Monitoring and Elimination to Maximise Success

World-class plant reliability is a foundational requirement for world-class production performance. Least cost operation needs equipment that does not break down, is low cost to run, requires minimal maintenance, is supremely safe, maximizes throughput, and makes 100% quality product all the time. These are all life-cycle process outcomes that are achievable only from processes designed and run to produce those results. The Stress-to-Process Model of asset management, coupled with Physics of Failure Reliability Strategy Analysis, is used for life-cycle process design in the Plant Wellness Way.

Design Processes to Operate Successfully

A process should work continuously at optimal performance. The effectiveness of a process is impacted by each of its steps. The success of a process depends on its step reliabilities and they in turn depend on the adverse risks in the step. How each step is configured to optimize the process is important. To maximize success, a process is simulated using Chance of Success Mapping to find effective ways to make process steps robust and reliable. After that, the improvements are written into ACE 3T standard operating procedures and those involved with the work are trained on how to run the process more successfully.

Establish Process and Step Performance Indicators

On a process map, specify the performance indicators used to monitor the process and its steps. Key Performance Indicators are required for the whole process, and intermediate Performance Indicators are used for each process step. They let people see how the parts of a process are working and whether corrections are needed. Those measures at the process step level are used by the people doing the work to spot losses, waste, and opportunities for improvement. The measures

at the process level are used by management to guide them in optimizing the process and maximizing operating profit.

Gather Evidence and Measure Performance and Chance of Success

The range of performance measures used includes those needed to confirm that process steps have been correctly done and to ensure that future work will be done correctly. This requires a mix of leading and lagging indicators. All performance indicators are plotted on a run chart. From that run chart, the frequency distribution curve is developed to see how stable the values are and how successfully the process and its steps operate.

The operating procedures include the collection of data for performance indicators. Gathering, analysing, and interpreting process data are a part of what the people running and managing a process do. They use the measurements they take to check for themselves how the process is tracking. You give those with the problems the knowledge and tools they need to find the solutions for themselves.

Monitor for Reliability and Improvement Opportunities

Visual means such as diagrams, charts, and graphs are used to turn data into easily understood, useful information. When performance is not what is wanted, team up with the people in the process and plan what to do about it. Test the ideas and document, train, and then implement permanent changes to solve the problem. Use PIs to track the direction and progress caused by the improvement. Correct and improve those activities that are not yet performing well enough with the help of the people doing them. You can use the Change to Win improvement program to get ownership and involvement when solving problems.

Engineer Processes to Run Most Successfully

At a Plant Wellness Way site, each business process is designed and built to produce outstanding equipment reliability based on the Stress-to-Process Model of asset management. How to achieve world-class plant and machinery reliability is specified in the Physics of Failure Reliability Strategy Analysis. It outlines what to do in your operation to prevent and control equipment failure and create lasting plant reliability. That knowledge and the required methods are put into your processes and become standard practice to do for everyone in your organization and its supply chains using ACE 3T procedures.

You start engineering your Plant Wellness Way asset management system and processes by drafting process maps for all life-cycle processes across your operation. In combination, the process maps explain how the operation is to be run to achieve all its aims. A process begins as a mental construct laid out on paper. Initially, it not important for a process design to be totally right. It will be put through the six IONICS steps and come out completed in its most effective form. (A summary of the IONICS process can be found in the Appendix.)

Process Chance of Success Modelling

The future is never 100% certain, but you can influence your chance of success to a great extent. To get the operating results you want, you need to remove the effect of chance variation and adverse risk on process performance. The Plant Wellness Way gets you to design your asset management processes for maximum success by specifying exactly how to be most successful. You can improve your chance of getting great operational performance by using Chance of

Success Mapping to refine your asset management, operations, plant maintenance management, and equipment reliability creation processes.

Using a process map and ACE procedures, a review is done to build a more successful process by removing weaknesses from the original design. In a spreadsheet, you perform Chance of Success Mapping one process step at a time. When you find potential troubles, defects, and risks, you introduce more successful solutions. The effectiveness of a redesigned process step is checked by confirming that the new design delivers better outcomes than the previous version.

An example of how to use Chance of Success Mapping for process design is shown in Tables 22.1 and 22.2. The example investigates an existing maintenance process used to select shutdown and turnaround work. A maintenance shutdown or turnaround requires a production outage, and the duration must be kept to the shortest possible time. Understanding the amount of work to be done, the type of work, and its complexity are key factors in the shutdown's success. The workload chosen will set the costs, staffing, and length of the outage. Until the decision is finalized, all necessary skills, resources, support services, equipment hires, and other requirements cannot be established or organized. It is an important process to get right.

All the steps in the process map for the shutdown work selection process are transferred to the top of the Chance of Success Mapping spreadsheet. Each of the tasks in a step is considered for the ranges of success from low to high. The low estimate is based on the worst events known to happen in the company for each task, and the high value represents the best-known outcomes for the task. The worst-to-best spread of odds covers the full extent of results that can occur in the task under investigation. The low probabilities of success for all steps are multiplied together, as are the high probabilities of success, and the current range of chance of success for the whole

process is determined. The process performance indicated will either make you happy or get you worried. In the example, the chance of success for the shutdown work list being correct goes from an abominable 1% to as good as 90%. This process produces wide variation and has many weaknesses that need to be improved.

Chance of Success Mapping: Identify All Shutdown Work Scope Content

LEGEND **SSCH**-Shut Scheduler **CONT**-Controller **PSVR**-Production Supervisor

LEVEL 2 PROCESS STEPS			2-12.0-01 Identify All Shutdown Work			2-12.0-02 Collect into a Proposed Shutdown Work List			2-12.0-03 Prioritize Proposed Shutdown Work List by Duration Impact			2-12.0-04 Identify Manning Constraints by Trade Type and Hours			2-12.0-05 Identify External Resources (e.g., hire equipment, cranes, EWPs, etc.)		
	Chance of Process Success			Chance of Success for This Step			Chance of Success for This Step			Chance of Success for This Step			Chance of Success for This Step			Chance of Success for This Step		
	Low %	High %		Low %	High %		Low %	High %		Low %	High %		Low %	High %		Low %	High %
PROCEDURAL ACTIVITIES			2-12.0-01-**SSCH**: Check previous postshutdown report minutes for deferred work	90	100	2-12.0-02-**SSCH**: Create a list of all work to be considered for the shutdown			2-12.0-03-**SSCH**: Investigate the list of proposed shutdown work with the aim to minimize shutdown duration and get back into production as fast as possible	80	100	2-12.0-04-**SSCH**: Identify potential manpower loading by trade type and estimated hours	90	100	2-12.0-05-**SSCH**: Determine all likely external equipment and physical resources to quantify the resource loadings	90	100
			2-12.0-01-**SSCH**: Include all long-lead items and services work	90	100				2-12.0-03-**SSCH**: Develop Gantt charts of proposed shutdown work list	90	100	2-12.0-04-**SSCH**: Determine whether potential manpower hours by trade are greater than allowed manpower hours by trade	80	100	2-12.0-05-**CONT**: Contractor management plan is used for engaging and managing all contract resources	80	100
			2-12.0-01-**SSCH**: Include classified plant inspections requiring a shutdown	90	100				2-12.0-03-**SSCH**: Develop critical paths from work list Gantt charts	80	100	2-12.0-04-**SSCH**: Identify whether there is sufficient 30:1 supervision for the manpower loading	90	100			
			2-12.0-01-**SSCH**: Include safety improvements requiring a shutdown	90	100												
			2-12.0-01-**SSCH**: Include production improvements and preparations for process/operating trials	90	100												
			2-12.0-01-**SSCH**: Include new legal and statutory requirements that come into force on prescribed dates	80	100												
			2-12.0-01-**SSCH**: Include approved capital projects with own work orders and work packs developed for each job	90	100												
			2-12.0-01-**SSCH**: Include condition monitoring report recommendations requiring shutdown	80	100												
			2-12.0-01-**SSCH**: Include new operations group maintenance requests requiring a shutdown	90	100												
			2-12.0-01-**SSCH**: Include opportunity maintenance work	80	100												
Chance of Success Currently	**1**	**90**		24.5	100		Step is dependent on prior step--not included			57.6	100		64.8	100		72	100

	2-12.0-06 Identify Work without Estimated Manning or Resources		2-12.0-07 Issue Shutdown Work List to Meeting Attendees for Review		2-12.0-08 Hold the Shutdown Scope Selection Meeting		2-12.0-09 Compile the Preliminary Shutdown Work List
	2-12.0-06-**SSCH**: Determine all jobs that have not yet been fully assessed to gauge the scale of planning time and effort they will require	90 100	2-12.0-07-**SSCH**: Provide all attendees with the list of all work for consideration to be done during the shutdown 24 hours before the shutdown scope selection meeting	50 90	2-12.0-08-**CONT**: Shutdown manager/controller runs the shutdown scope selection meeting using the shutdown scope selection meeting agenda. The meeting attendees select work intending to be done in	90 100	2-12.0-09-**SSCH**: The outcome of the shutdown scope selection meeting is a list of work included in the shutdown, known as the preliminary shutdown work list
		80 100	2-12.0-07-**SSCH**: Provide all attendees with preliminary manpower estimates by trade type	90 100	2-12.0-08-**CONT**: Include lessons learned from prior shutdown	80 100	
					2-12.0-08-**CONT**: Identify statutory and mining regulation compliance lisues	80 100	
					2-12.0-08-**SSCH**: Arrive prepared to answer the items they are responsible for in the shutdown scope selection meeting agenda	80 100	
					2-12.0-08-**PSVR**: Arrive prepared to answer the items they are responsible for in the shutdown scope selection meeting agenda	80 100	
Chance of Success for This Step	Low %	High %					
	72	100					
Chance of Success for This Step	Low %	High %					
	50	90					
Chance of Success for This Step	Low %	High %					
	Step is dependent on prior step- not included						
Chance of Success for This Step	Low %	High %					
	36.9	100					

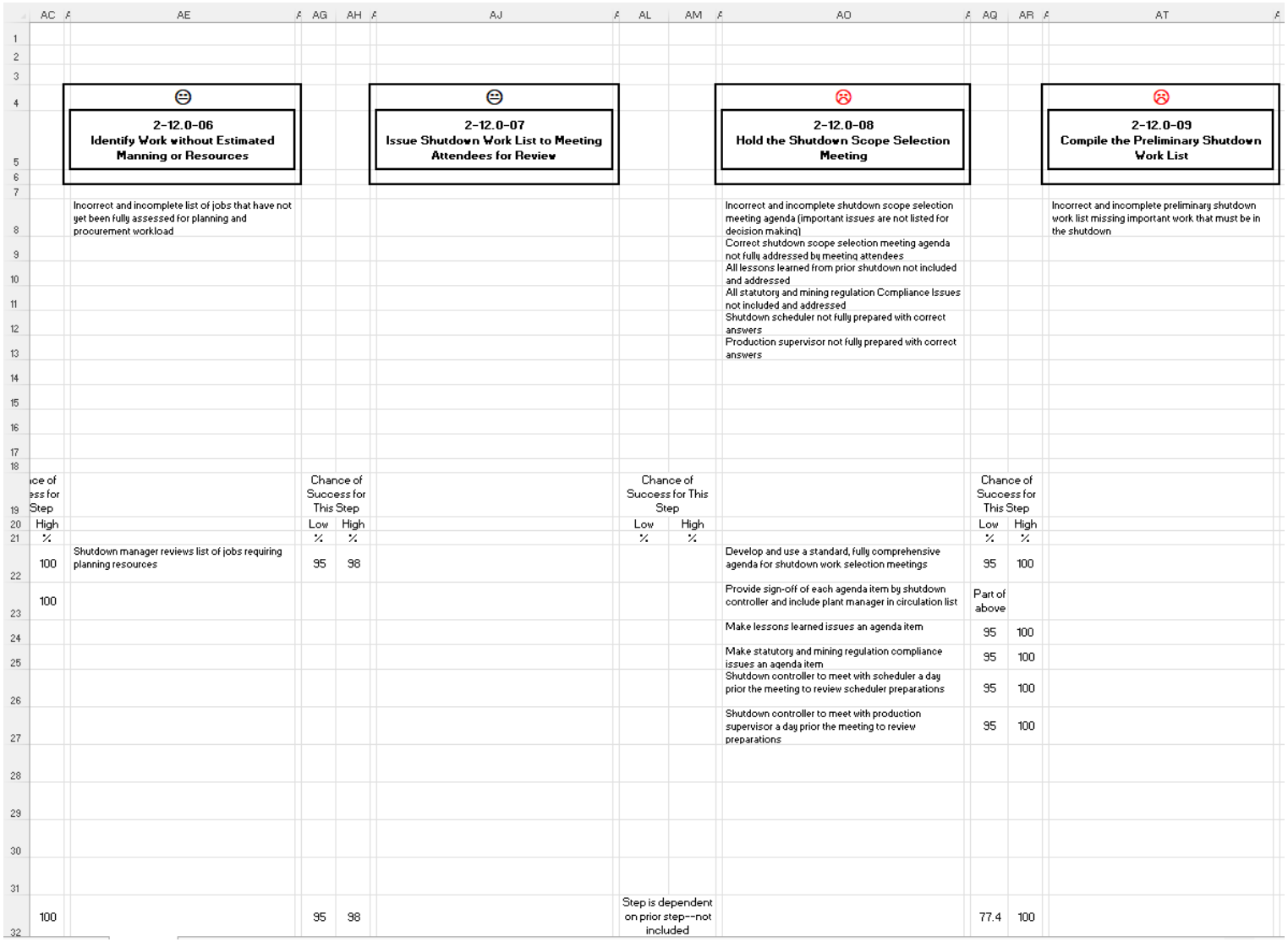
Table 22.1–Existing Process Chance of Success for a Maintenance Shutdown Work List

Creating a more successful process involves understanding where and how the current process steps fail and then designing and implementing better solutions. A risk analysis is conducted on each weak step, one task at a time, to identify the problems that can arise. Mitigations are developed for each weakness to ensure correct performance of the task. The investigation, analysis, and improvements continue step by step until the whole process is reengineered to be highly reliable and to maximize its chance of success. Table 22.2 shows the redesigned shutdown work selection process. The new range of low to high chance of success is 40% to 92%. This range is still too great, however, and too much variation remains. Further work is needed to minimize the risk of failing to properly define an accurate list of shutdown work. There is still too much opportunity to jeopardize the outage or fail to get the full benefit to future plant uptime through wrong allocation of staffing, resources, and infrastructure needed to do a successful maintenance shutdown.

Chance of Success Process Review: Identify All Shutdown Work Scope Content

LEGEND **SSCH**-Shut Scheduler **CONT**-Controller **PSVR**-Production Supervisor

LEVEL 2 PROCESS STEPS	2-12.0-01 Identify All Shutdown Work		2-12.0-02 Collect into a Proposed Shutdown Work List		2-12.0-03 Prioritize Proposed Shutdown Work List by Duration Impact		2-12.0-04 Identify Manning Constraints by Trade Type and Hours		2-12.0-05 Identify External Resources (e.g., hire equipment, cranes, EWPs, etc.)	
Risk Causes in Step Tasks	Postshutdown report ninutes not checked for deferred work and included				Insufficiently detailed investigation of the list of proposed shutdown work to find how to minimize outage duration		Incorrect and incomplete manpower loading by trade type and estimated hours		Incorrect and incomplete external equipment and physical resources identified	
	Long-lead items and services work not checked and included				Incorrect and incomplete Gantt charts		Incorrect and incomplete trade type manpower leveling		Incorrect and incomplete contractor management plan	
	Classified plant inspections not checked and included				Incorrect and incomplete critical paths		Incorrect and incomplete identification of supervisory requirements			
	Safety improvements not checked and included									
	Production improvements and preparations for process/operating trials not checked and included									
	New legal and statutory requirements not checked and included									
	Approved capital projects with own work orders not checked and included									
	Condition monitoring report recommendations not checked and included									
	New operations group maintenance requests not checked and included									
	Opportunity maintenance work not checked and included									
	Chance of Success for This Step		Chance of Success for This Step		Chance of Success for This Step		Chance of Success for This Step		Chance of Success for This Step	
	Low	High	Low	High	Low	High	Low	High	Low	High
	%	%	%	%	%	%	%	%	%	%
Risk Controls	Postshutdown report minutes check included in project management ITP and shutdown manager report	98 100			Shutdown manager reviews work list from scheduler	95 98	Shutdown manager reviews manpower loading by trade type and estimated hours	95 100	Shutdown manager reviews external equipment and physical resources required	95 100
	Long-lead items and services work check included in project management ITP and shutdown manager report	98 100			Shutdown manager reviews Gantt charts	95 98	Shutdown manager reviews trade type manpower leveling	95 100	Shutdown scheduler reviews contractor management plan	95 100
	Classified plant inspection check included in project management ITP and shutdown manager report	98 100			Shutdown manager reviews critical paths	95 98	Shutdown manager reviews supervisory requirements	95 100		
	Safety improvements check included in project management ITP and shutdown manager report	98 100								
	Production improvements and preparations for process/operating trials check included in project management ITP and shutdown manager report	98 100								
	New legal and statutory requirements check included in project management ITP and shutdown manager report	98 100								
	Approved capital projects with own work orders check included in project management ITP and shutdown manager report	98 100								
	Condition monitoring report recommendations check included in project management ITP and shutdown manager report	98 100								
	New operations group maintenance requests check included in project management ITP and shutdown manager report	98 100								
	Opportunity maintenance work check included in project management ITP and shutdown manager report	98 100								
Chance of Success for Redesign	**40** **92**	81.7 100		Step is the sum of prior step--not included		85.7 94.1		85.7 100		90.3 100



	2-12.0-06 Identify Work without Estimated Manning or Resources		2-12.0-07 Issue Shutdown Work List to Meeting Attendees for Review		2-12.0-08 Hold the Shutdown Scope Selection Meeting		2-12.0-09 Compile the Preliminary Shutdown Work List
	Incorrect and incomplete list of jobs that have not yet been fully assessed for planning and procurement workload				Incorrect and incomplete shutdown scope selection meeting agenda (important issues are not listed for decision making)		Incorrect and incomplete preliminary shutdown work list missing important work that must be in the shutdown
					Correct shutdown scope selection meeting agenda not fully addressed by meeting attendees		
					All lessons learned from prior shutdown not included and addressed		
					All statutory and mining regulation Compliance Issues not included and addressed		
					Shutdown scheduler not fully prepared with correct answers		
					Production supervisor not fully prepared with correct answers		
...ce of ...ss for Step		Chance of Success for This Step		Chance of Success for This Step		Chance of Success for This Step	
High		Low	High	Low	High	Low	High
%		%	%	%	%	%	%
100	Shutdown manager reviews list of jobs requiring planning resources	95	98		Develop and use a standard, fully comprehensive agenda for shutdown work selection meetings	95	100
100					Provide sign-off of each agenda item by shutdown controller and include plant manager in circulation list	Part of above	
					Make lessons learned issues an agenda item	95	100
					Make statutory and mining regulation compliance issues an agenda item	95	100
					Shutdown controller to meet with scheduler a day prior the meeting to review scheduler preparations	95	100
					Shutdown controller to meet with production supervisor a day prior the meeting to review preparations	95	100
100		95	98	Step is dependent on prior step--not included		77.4	100

Table 22.2–Reengineered Process Chance of Success for the Shutdown Work List

Establish Process and Step Performance Indicators

Each process has a purpose, and every step in the process has a role. A process step is there to convert inputs into outputs and to move the process toward its required conclusion. How successfully a step does this can be monitored by the effectiveness of its performance and the quality of the results it feeds to the rest of the process.

In the process maps and modelling spreadsheets, you have a description of the purposes of each process step. It is necessary to set measures to check each step and indicate its success. Typically, a step's measures monitor how well its outputs meet the required quality and efficiency for the step, but monitoring can extend to checking individual task outcomes when necessary. The same applies for the complete process. KPIs monitor total process success, and PIs observe step success. Whole-of-process measures usually monitor productivity issues such as overall costs, timeliness of delivery, and quantity of saleable production. You observe overall process and individual step performance using run charts for KPIs and PIs to track, trend, and report on a step or process. The same values are used to plot the frequency distribution curve of results. This curve shows the chance that the process or step will deliver the required performance. If required performance cannot be consistently achieved, the process and its steps are investigated for weaknesses and redesigned to be more successful.

Gather Evidence and Monitor Results and Chance of Success

Collect the designated process and step performance data and present it visually in run charts. For individual critical steps and the whole process performance, show each measure's trends and plot each measure's frequency distribution curve. For example, successful maintenance prevents equipment failures and minimizes production losses. It does that by keeping plant and equipment

fit and in good health. Fit plant and equipment in good condition cost less to operate while making quality production to schedule. To measure the success of maintenance, you measure the share of maintenance costs in your production costs; they should be decreasing with time. The run chart should show a steady falling trend over time. When a trend flattens out, it indicates that the current process design has reached its limits of improvement and a design change is needed to get further improvement. You would also monitor individual production assets performance to ensure the maintenance efforts used on the assets reduce operating waste, costs, and losses while maximizing asset availability.

Monitor for New Reliability and Improvement Opportunities

The aim of process improvement is to enhance a process design so that its natural performance delivers results well within specification. When the performance monitoring indicates problems, you investigate the situation to determine its business impact and whether it is necessary to address the situation or leave it alone. It is not worth making changes to a process if the long-term economics of the situation does not justify the effort required and the resulting benefits. Doing a financial justification to make the business case for a change to improve asset reliability or enhance process performance is important so that you have confidence that the improvement will bring worth to the organization.

Progress and development are evolutionary processes, not revolutionary processes. Those companies that evolve fastest are more successful than those that wait for change to be imposed on them. If you want rapid evolution in your operation, help people remove defects in their processes that become problems, help them gain the skills that create success, encourage the sharing of successful knowledge across the organization, and ensure that all new successes are embedded into your procedures so that they become a habit.