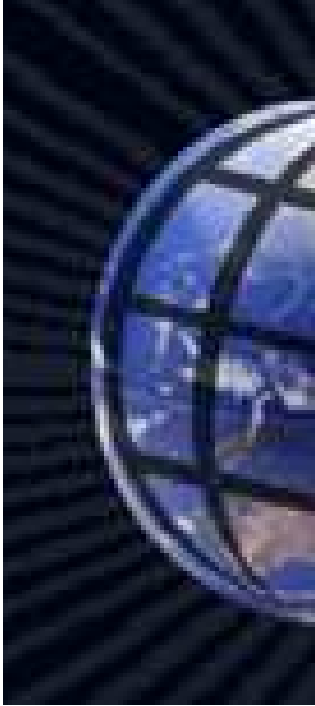


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# BHP Billiton

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## Regional Supply Council Leading Practice – Repairables Management

08/10/2003  
Version 03

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Approved by: **Regional Supply Council**

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## DOCUMENT INFORMATION & REVISION HISTORY

<b>Title</b>	Regional Supply Council Leading Practice – Rotables Management
<b>Document Purpose</b>	This documents Leading Practice in Rotables Procurement & Management as identified by the Australian Regional Supply Council.
<b>Key Words</b>	
<b>Document Number</b>	
<b>Contact for Enquiries</b>	Andrew Bennett Regional Supply Australia +61 7 3226 0460
<b>Proposing Changes</b>	If you have a suggestion for improving this document please contact Andrew Bennett.

<b>Issue No</b>	<b>Issue Date</b>	<b>Author(s)</b>	<b>Nature of Amendment</b>
1	12/08/2003	Andrew Bennett	Initial release for Regional Supply Council Comment
2	28/08/2003	Andrew Bennett	Initial release for Regional Supply Council Comment, including amendments to process flow in section 3.1.2
3	08/10/2003	Andrew Bennett	Release for ARSC approval incorporating feedback from stakeholders on Version 1 & 2.

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## 1. OBJECTIVES:

The objective of the Australian Regional Supply Council is to create sustainable and measurable value for the Australian assets through collaborative and effective leadership of Supply initiatives.

The collaborative identification and documentation of leading practice in Repairables management is an initiative of the Australian Regional Supply Council.

This Leading Practice will assist in the implementation of standard Repairables management business processes throughout the Australian operations, which in turn will deliver savings to operations, as identified by the Australian Regional Supply Council Business Plan, through increased efficiency and effectiveness of both Supply and Maintenance functions.

Additionally, the documented Leading Practice will guide the configuration of Procurement & Maintenance systems (i.e. GSAP, MIMs) to ensure they support the recommended business processes.

## 2. DEFINITIONS

**Repairable Spare:** Repairable spares represent spare parts that have previously been removed from plant and equipment due to deficient performance and have been repaired or restored to a condition whereby they are once again suitable for use in that plant and equipment.

Where the repairable spares are spares *recorded in fixed assets and being depreciated*, the repairable spares are to be maintained in the inventory system at a nil value. Any costs of repairing or restoring the spare are to be expensed as incurred. When this item is subsequently used in plant and equipment it should be transferred out of inventory and into fixed assets. As the item is carried at zero book value, there will be no depreciation required for this asset.

Where for practical inventory management purposes an asset holds such repaired spares at 'value', then a 'credit offset' account may be employed to ensure a net nil value position of such spares. The principle to be adhered to is that such spares are not to be recorded at value in inventory when there is a value recorded in fixed assets, which is being depreciated.

Where the repaired spares are spares, which have been expensed previously (i.e. not recorded in fixed assets and being depreciated), such spares are to be recorded in inventory at repair costs, or where appropriate, at weighted average repair costs (i.e. for similar spares with similar repair costs). Such repaired spares are to be accounted for separately to new spares. It is not appropriate to pool new and repaired spares and value the pool at a weighted average of acquisition and repair costs. At time of issue of these spares, any book value is expensed.

*Source: BHP Billiton Accounting Policy Manual*

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**Capital Spare:** Capital spares refer to spares purchased as part of a project capital expenditure authorisation. They are spare parts that are regularly replaced usually as part of a general replacement program. These spares must be capitalised into fixed assets and depreciated over the useful life of the spare. Where a Spare is purchased specifically for the use on a particular asset, and would become redundant if the use of the asset discontinued, the spare should be depreciated over the life of the asset to which it relates.

Where an item of equipment becomes obsolete, the value of any capital spares held for that equipment must be written off, except to the extent that the value of the capital spare can be recovered through its sale or use in other equipment.

*Source: BHP Billiton Accounting Policy Manual*

**Insurance Spare:** Insurance spares are spares purchased and held with no defined plan of consumption but to ensure the continuity of production should a similar part in plant or equipment fail. Insurance spares are usually held as back up for capital spares.

Insurance spares are to be accounted for in the same manner as capital spares.

*Source: BHP Billiton Accounting Policy Manual*

**Material/Component:** Repairable Spare that has been catalogued and part of the Inventory Management System. A material or component may be managed as Equipment.

**Un-catalogued Spare:** For the purposes of this document an un-catalogued spare is a repairable spare that has not been catalogued, is not managed as Equipment or repaired internally.

**Rotable Spare:** An item of plant that is required to be tracked individually throughout the repair/replacement process as well as in service life. Generally an Equipment, these items will be identified through a risk assessment of plant equipment criticality. Some of these items may be classified as a repairable item.

**Equipment:** An individual object that is to be maintained independently. Each piece of equipment is managed independently in the system, so that you can:

- Manage individual data from a maintenance perspective for the object
- Perform individual maintenance tasks for the object
- Keep a record of the maintenance tasks performed for the object
- Collect and evaluate data over a long period of time for the object

Pieces of equipment can be installed and dismantled at functional locations. The usage times for pieces of Equipment at a Functional Location are documented over the course of time.

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Examples of equipment items could include functional units such as pumps, compressors, motors and pressure vessels, etc.

Material that is managed as Equipment is usually serialised, and therefore a Rotable Spare.

**Serial Number / Serialisation:** Serial numbers are used to identify and differentiate between individual items of material. This component therefore ideally supplements the material master record, which may contain all data for describing and managing a piece of material, but which does not enable you to differentiate between individual items of that material.

You can use serial numbers in various business procedures within Maintenance and Supply. In each case, a transaction history is created for the individual serialized item and its status is maintained automatically.

The use of this functionality is referred to as "Serialisation"

**Refurbishment Work Order:** A special order, which you use for the refurbishment of inventory managed (and therefore material numbered) repairable spares.

The order can refer to the following types of repairable spare:

- One or more individual repairable spares (combination of material and serial number, for which an equipment master record can also be created, if necessary)
- One or more non-individual repairable spares (material)

The repairable spares scheduled in the order are brought from a uniform initial condition (Damaged) to a uniform end condition (Repaired). You can distinguish between these conditions using batches or different valuation types.

**Materials Requirements Planning (MRP):** The central role of material requirements planning is to monitor stocks and, in particular, to automatically generate order proposals for purchasing and production (planned orders, purchase requisitions, or delivery schedules).

For more detail on SAP MRP:

[SAP Help](#)

**Sub-Contract Purchase Order:** A purchase order that allows material to be issued to the vendor for the manufacture/repair of a material.

In the context of repairable spares this order can be used to issue the material to be repaired to the repairer. This allows traceability of the materials as they can be seen in the inventory system as "DAMAGED" stock with Vendor.

For more detail on this type of order as used in SAP:

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[SAP Help](#)

### **3. REPAIRABLE INVENTORY**

#### **3.1. Non Equipment externally repaired Materials/Components**

##### **3.1.1. Scope**

This process is for the external repair of Materials/Components held in inventory.

It excludes materials managed as Equipment, for which a detailed repair history on individual units must be captured via a Maintenance Work Order, and those Materials/Components repaired internally. Repair of these Materials/Components must be managed via a Refurbishment Work Order.

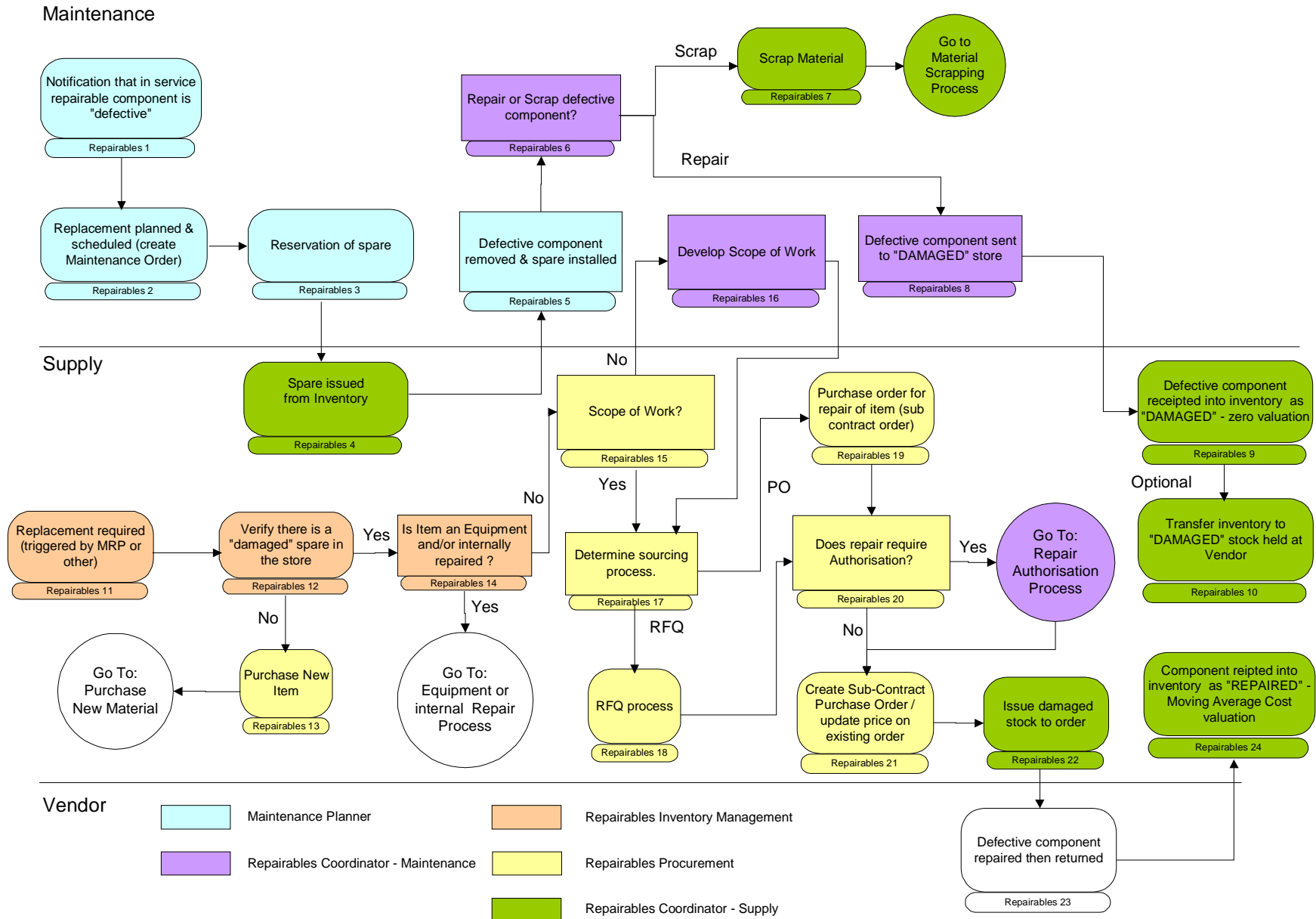
This process commences with the requirement to change out a malfunctioning Component through to the external repair and return to inventory of that Material as "REPAIRED", including the scenario where a damaged Component is not considered economical to repair and needs to be scrapped and a replacement new material purchased.

Materials of this nature will have the valuation types of "NEW", "REPAIRED" and "DAMAGED".

"NEW" and "REPAIRED" Materials will be held in stock at moving average value, "Damaged" Materials will be held in stock at nil value.

All Materials that are repairable should be stocked; this process does not cover the repair of catalogued non-stocked repairable spares.

### 3.1.2. Process Flow



## **Repairables 1**

A notification will be created to identify that a Component is defective and needs to be changed out.

## **Repairables 2**

A Maintenance Order is created, planned and scheduled to carry out the work.

## **Repairables 3**

A reservation is planned on the Maintenance Order for a replacement Component.

## **Repairables 4**

The replacement Material reservation is issued from the store.

## **Repairables 5 (area maintenance team).**

The work is carried out to replace the defective Component.

## **Repairables (7) 6 (repairables coordinator and supply planner).**

Determine if the defective Component is economical to repair. The condition of the Component should be considered as well as the criticality and availability of a new replacement.

This decision must be made with adequate knowledge of repair costs and procedures for that Component. Manufacturer and/or Vendor material may be available to assist in the technical evaluation of a component's suitability for repair.

If there is any doubt then the Component should be assumed repairable (and returned to the store). **REMOVE**

## **Repairables (8) 7**

If Component is uneconomical to repair, it may be scrapped on physical removal from the equipment.

The decision to scrap a Component must be recorded in the system for the information of those further down the process looking for the damaged Material to be returned to inventory.

## **Repairables (6) 8 (area maintenance team).**

If the Component is to be repaired then the damaged item is to be returned to the store by the Maintenance Practitioner. **REMOVE.**

Damaged Components are to be delivered to the Warehouse Assessment Area with a fully completed OSR Tag attached.

The damaged components must be returned to the warehouse Equipment Assessment Area in a condition suitable for transport and/or storage, including the removal hazardous chemicals, process liquor and be drained of oil as per the site

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**Decontamination Procedure.** Any ports that may leak must be sealed and a Process Material Tag completed and attached.

Additionally, a report should be run on a periodic basis (weekly, daily) that lists all issues of repairable Materials. This will enable the follow up of repairable materials that have been issued (new or repaired) but have not yet had a corresponding return to inventory for repair. ????

### **Repairables 9**

Damaged Materials are returned to inventory with valuation type “DAMAGED” and held at zero value.

Damaged Materials are to be issued back into inventory with reference to the Work Order on which the Component was changed out. This will assist in tracking the movement of the Materials by allowing a match up of items issued to Work Orders (New or Repaired) with corresponding returns to damaged stock.

Damaged store is excluded from MRP calculations.

### **Repairables 10 - Optional**

In some instances, for example high volume critical Components, damaged Materials may be sent straight to the Vendor for repair, not stored on site.

Once issued back into inventory the materials may be transferred to Stock Held at vendor within the damaged store. This would allow the materials to be sent to the vendor’s premises for repair but still be visible in inventory as damaged stock on hand.

Vendors will then have the Materials on site ready to repair upon receipt of a purchase order, or repair the Materials but not ship them or send an invoice until receipt of a purchase order.

Damaged materials can still be issued to a Sub-Contract Purchase Order; it will just be from damaged stock with Vendor rather than from damaged Stock on site.

### **Repairables 11**

If the re-order point is broken for a material then MRP will suggest that the stock be replenished. Repairables Inventory management (see section 5.3) would then review the suggestion and decide on appropriate course of action – to repair a damaged Material or to purchase a new one.

Configuration of Repairable Materials should ensure they are replenished via sub-contract type requests/purchase orders.

Additionally, repairable materials should be created as Material Bill of Material (BOM), with the material number attached as a component.

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This will allow MRP to generate sub-contract requisitions with the material automatically attached as a component, as the Material BOM is exploded when the requisition is created, ready for the issue of a “DAMAGED” material.

By implementing a contract for the repair of the material, the Sub-Contract Purchase Order may be automatically generated, once Repairables Inventory management has released the requisition.

The resulting Sub-Contract order will be for the supply of a repaired material and will list the same material as a component to be supplied by the purchaser.

Transport details of the material sent for repair will be provided via a system generated Shipping Documentation. The Shipping Documentation is generated and sent to the Vendor at the time of the issue of the material to the Sub-contract Order, as per

### **Repairables 22.**

Alternatively, a business decision may be made independently of MRP, to repair a material. In this instance a sub contract requisition needs to be manually created to initiate the repair process.

### **Repairables 12**

The availability of a damaged material suitable for refurbishment will be considered in the decision to repair or to purchase a new replacement.

If a material has been returned to the store as “DAMAGED” it will be should visible in the Damaged storage location.

If materials have not been returned, there may be no “DAMAGED” available for repair. In the absence of a damaged item to repair, it may be decided to purchase a new item.

### **Repairables 13**

Where there are no items available for repair the component added to the sub contract requisition (though the explosion of the Material BOM) needs to be deleted, as there are no damaged materials to issue to the order.

If the requisition has been assigned a source of supply for the repair of the Material (i.e. a Repair Outline agreement) it needs to be replaced with a source of supply for of a new material, this may be the same vendor just a different contract/price.

Additionally, the Valuation type on the requisition must be changed from “REPAIRED” to “NEW”.

### **Repairables 14**

Determine whether the Material is managed as Equipment, and/or repaired internally.

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Repair of materials managed as Equipment and/or repaired internally must be managed via a Refurbishment Work Order.

This process is detailed in section 4.2.

### **Repairables 15 (repairables coordinator)**

Scopes of work are required for all repairs and must be made available to the internal or external repairer prior to quotation or work commencing.

Scopes of work are to be sent to the repairer at time of transmission of Request For Quotation or Repair Purchase Order.

References to special or standard scopes of work, available for the repairer to download from an Internet site, may also be sent to the vendor.

Scopes of work may be negotiated with a repairer as part of a contract for the repair of materials, and therefore would not need to be sent with each order calling off that contract.

### **Repairables 16 (repairables coordinator).**

If there is no scope of work available for an item it must be developed prior to the repair work commences.

Supply & Maintenance should work co-operatively to develop appropriate scopes of work for each repairable material.

Resources available for Development of Scopes of work:

- An email addressed to [bhp-maint-mip](mailto:bhp-maint-mip) can be used to request details of any existing Scopes of Work for the specific repairable component from the BHPB Maintenance Community.
- Alternatively you can contact the GMN representative for your site as shown in the GMN Intranet link below:

[GMN Representative](#)

- BHPB Project Management Intranet Site:

<http://pdscoe.bhpbilliton.net/bb/home/home.asp>

### **Repairables 17**

If a contract is in place for the repair of the material it will be assigned as the source of the supply on the requisition when it is created (via MRP or manually).

Where no contract is in place there are two options:

- Create a RFQ for the repair

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- Create a Purchase Order with an estimated price, which is updated once the vendor has had the opportunity to examine item and quote on the repair.

Depending on the nature of the item the most appropriate process is used.

### **Repairables 18**

A request for Quotation (RFQ) is generated for the repair of the material.

### **Repairables 19**

If a contract exists for the repair of the material the Repair Purchase Order is automatically generated, if not Repairables Procurement must process the requisition into a Purchase Order with an estimated price, that must be updated with the actual price prior to receipt.

### **Repairables 20**

Authorisation of repair should only be required only for an item where cost to repair exceeds 70% of purchase price of new replacement or over a certain value, as determined by operational requirements.

The authorisation process should be via an electronic workflow that allows expediting of outstanding approvals.

### **Repairables 21**

The approved requisition (from the RFQ process) needs to be converted into a purchase order; or

If Purchase Order has already been sent with an estimated price, the correct price must be updated (after authorisation where required) prior to goods receipt.

### **Repairables 22**

The damaged Material is issued from inventory and delivered to the vendor.

Transport Details (i.e. Consignment Note) are entered into the system as part of the issue of the materials.


This issue of the Material to the Sub-contract Purchase Order will automatically generate Shipping Documentation.

A copy of the Shipping Documentation should print in the warehouse with an additional copy emailed to the vendor.

The Shipping Documentation should detail the transportation arrangements, clearly identify the Material and reference the Purchase Order requesting the repair.

### **Repairables 23**

External Repair.

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Upon receipt of a Purchase Order the vendor repairs the material, as per the agreed scope of work and returns it to site in time to meet the agreed delivery date.

### **Repairables 23**

Sub-Contract Purchase Orders are receipted via standard receipt process.

Materials are receipted into inventory as “REPAIRED” valuation type and at moving average value.

## **3.2. Equipment or Internally Repaired Materials/Components**

### **3.2.1. Scope**

This process is for the repair of Materials/Components held in inventory and managed as Equipment or repaired internally.

Equipment items have been identified as materials that require a maintenance history of individual units captured via a Maintenance Work Order.

Internally repaired items require the planning and scheduling of resources for an internal repair to be controlled via a Maintenance Work Order.

Refurbishment Work Orders will be used for these materials.

This process commences with the requirement to change out a malfunctioning piece of equipment through to the repair and storage of that equipment.

Note: It also covers the scenario where a damaged piece of equipment is not considered economical to repair and needs to be scrapped and a replacement material purchased.

As Equipment items are generally serialised to allow tracking of individual items through the Maintenance & Materials Management system, this process will also cover the use of “Serialisation” of “Rotable” spares where Equipment Number & Serial No. Functionality is used.

If serialisation is used, then the serial number will need to be provided when carrying out any stores movements or purchasing activities as well during the creation of a Maintenance order for the repair of the item.

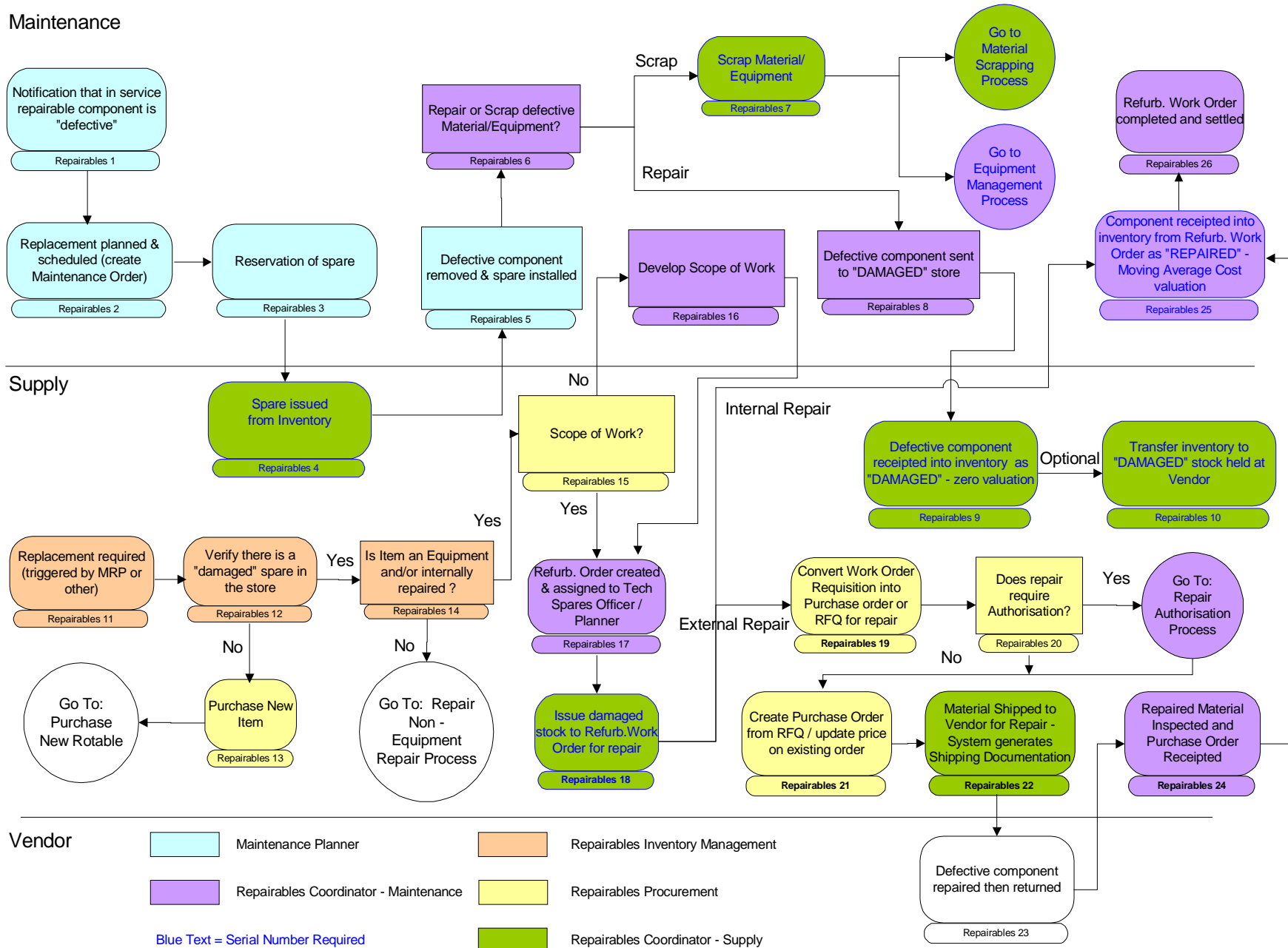
Materials of this nature will have the valuation types of “NEW”, “REPAIRED” and “DAMAGED”.

“NEW” and “REPAIRED” Materials will be held in stock at moving average value, “DAMAGED” Materials will be held in stock at nil value.

All Materials that are repairable should be stocked; this process does not cover the repair of catalogued non-stocked repairable items.

### 3.2.2. Process Flow

#### Maintenance



## **Repairables 1**

A notification will be created to identify that a piece of Equipment is defective and needs to be changed out.

## **Repairables 2**

A Maintenance Order is created, planned and scheduled to carry out the work.

## **Repairables 3**

A reservation is planned on the Maintenance Order for a replacement.

## **Repairables 4**

The Material spare reservation is issued from the store.

**Serialisation** – The serial Number of the replacement Equipment is required to issue the material to the Work Order.

## **Repairables 5**

The work is carried out to replace the defective Equipment.

## **Repairables 6**

Determine if the defective Equipment is economical to repair. The condition of the Equipment should be considered as well as the criticality and availability of a new replacement.

Note: this decision must be made with adequate knowledge of repair costs and procedures for that Equipment.

Manufacturer and/or Vendor material may be available to assist in the technical evaluation of an Equipment's suitability for repair i.e. Caterpillar Reusability Guidelines i.e. [Seal Wear Measurement \(Page 7\)](#) or [Engine Repair Management \(Page 15\)](#).

If there is any doubt then the Equipment should be assumed repairable and returned to the store.

## **Repairables 7**

If Equipment is uneconomical to repair, it may be scrapped.

The decision to scrap Equipment must be recorded in the system for the information of those further down the process looking for the damaged Material to be returned to inventory.

The decision to scrap and along with the reason must be recorded as text against the material document used to issue the replacement Equipment to the Work Order.

If the material is managed as Equipment, the Equipment master must be updated to reflect the scrapped status of the item, additionally if the Equipment is on the asset register this must also be updated.

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**Serialisation** – The serial Number of the material is required when performing the scrapping transaction.

### **Repairables 8**

If the Equipment is to be repaired then the Maintenance Practitioner must return the damaged item to the damaged store.

Repairable Equipment are to be returned with appropriate tagging, identifying the Material Number, Serial Number, Equipment Number and Work Order on which it was changed out.

The damaged components must be returned to the warehouse in a condition suitable for storage, including the removal hazardous chemicals and in accordance with site environmental requirements i.e. hydraulic fluid drained, removal of excess oil, ports sealed etc...

Additionally, a report should be run on a periodic basis (weekly, daily) that lists all issues of repairable Materials. This will enable the follow up, after reviewing the last issue for a decision to scrap, of repairable materials that have been issued (new or repaired) but have not yet had a damaged one returned to inventory for repair.

### **Repairables 9**

Damaged Materials are returned to inventory with valuation type “DAMAGED” and held at zero value.

A damaged Material should be issued back into inventory with reference to the order on which it was changed out. This will assist in tracking the movement of the Material by allowing a match up of items issued to a work order (New or Repaired) with a corresponding return to damaged stock via the report detailed above in Repairables 8.

**Serialisation** – The serial Number of the Material is required when booking the material into Damaged Stock.

Damaged store is excluded from MRP calculations.

### **Repairables 10 - Optional**

In some instances, perhaps high volume critical items, damaged items may be sent straight to the Vendor for repair, not stored on site. The vendor will then have the items ready to repair upon receipt of a purchase order, or have a contract in place that would allow them to repair the materials but not ship and invoice for the repair until receipt of a purchase order.

Once issued back into inventory the materials may be transferred to Stock Held at vendor within the damaged store. This would allow the materials to be sent to the vendor’s premises for repair but still be visible in inventory as damaged stock on hand.

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Damaged items can still be issued to the Repair Purchase Order; it will just be from stock with Vendor rather than from Stock on site.

**Serialisation** – The serial Number of the material is required when transferring the material from Damaged Stock on site to Damaged Stock with Vendor.

### **Repairables 11**

If the re-order point is broken for a material then MRP will suggest that the stock be replenished. Repairables Inventory management (see section 5.3) would then review the suggestion and decide on appropriate course of action – to repair a damaged Material or to purchase a new one.

Alternatively, a business decision may be made independently of MRP, to repair that item in which case a Refurbishment Work Order will be created to initiate the repair process.

### **Repairables 12**

The availability of a damaged spare suitable for refurbishment will be considered in the decision to repair or to purchase a new item.

If a damaged item has been returned to the store it will be visible in the “Damaged” storage location.

If items have not been returned, there may be no “Damaged” available for repair. In the absence of a damaged item to repair, it may be decided to purchase a new item.

### **Repairables 13**

Where there are no items available for repair the requisition must be assigned a source of supply relevant to the purchase of a new material.

A new Equipment master and serial number need to be generated for the new Rotable.

**Serialisation** – A serial Number for the new Rotable will be required to receipt it into inventory.

### **Repairables 14**

Determine whether item is managed as Equipment, and /or an internal repair facility exists.

Repair of materials not managed as Equipment and/or repaired externally do not require a Refurbishment Work Order. Requestions generated for these materials, via MRP or manually, may be used to initiate and manage the repair process.

This process is detailed in section 4.1.

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## Repairables 15

Scopes of work are required for all repairs and must be made available to the internal or external repairer prior to quotation or work commencing.

Scopes of work are to be sent to the repairer at time of transmission of Request For Quotation or Repair Purchase Order.

References to special or standard scopes of work, available for the repairer to download from an Internet site, may also be sent to the vendor.

Scopes of work may be negotiated with a repairer as part of a contract for the repair of materials, and therefore would not need to be sent with each order calling off that contract.

## Repairables 16

If there is no scope of work available for an item it must be developed prior to the repair work commences.

Supply & Maintenance should work co-operatively to develop appropriate scopes of work for each repairable material.

Resources available for Development of Scopes of work:

- An email addressed to [bhp-maint-mip](mailto:bhp-maint-mip) can be used to request details of any existing Scopes of Work for the specific repairable component from the BHPB Maintenance Community.
- Alternatively you can contact the GMN representative for your site as shown in the GMN Intranet link below:

[GMN Representative](#)

- BHPB Project Management Intranet Site:

<http://pdscoe.bhpbilliton.net/bb/home/home.asp>

## Repairables 17

A Refurbishment order is created and assigned to the appropriate planner to initiate and manage the repair of the item.

The creation of a refurbishment order will:

1. Generate a negative reservation that will cancel any outstanding MRP requisitions in the system (or reduce them by the relevant Quantity).
2. Create a reservation for damaged stock; this requirement will not impact MRP, as the damaged store is not planned in MRP calculations.

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The repair of the component is planned as an external operation in the Refurbishment Work Order; this will generate a Purchase Requisition for the Repair of the component.

Implementation of a contract with a Vendor for the repair of the materials will allow automatic conversion of these purchase requisitions into Repair Purchase Orders.

*Warranty: At the time of the creation of this Refurbishment Work Order the planner should be notified of any valid Warranty that exists on the equipment. This will allow the planner to ensure the remainder of the repair process is subject to any operational warranty requirements.*

**Serialisation** – The serial number for the Equipment to be repaired is required to create the Refurbishment order.

### **Repairables 18**

The damaged material is issued to the Refurbishment Work Order.

**Serialisation** – The serial number of the damaged material is required to issue it to the Refurbishment Work Order.

### **Repairables 19**

External Repair.

The requisition generated by the Work Order for the repair of the material, unless automated by a contract, will now require conversion into a Purchase Order.

Depending on the nature of the item there are two options:

- Create a RFQ for the repair – where the repair does not require the material sent to them for inspection before they can quote;
- Create a Purchase Order with an estimated price, which is updated once the vendor has had the opportunity to examine item and quote on the repair.

### **Repairables 20**

External Repair.

Authorisation of repair should only be required only for an item where cost to repair exceeds 70% of purchase price of new replacement or over a certain value, as determined by operational requirements.

The authorisation process should be via an electronic workflow that allows expediting of outstanding approvals.

### **Repairables 21**

External Repair.

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The approved requisition (from the RFQ process) needs to be converted into a purchase order; or

If Purchase Order has already been sent with an estimated price, the correct price must be updated (after authorisation where required) prior to goods receipt.

### **Repairables 22**

The damaged Material is sent to the Vendor for repair.

Transport Details (i.e. Consignment Note) are entered as part of the creation of system based Shipping Documentation.

A copy of the Shipping Documentation should print in warehouse with an additional copy emailed to the vendor.

The Shipping Documentation should detail the transportation arrangements, clearly identify the Material and reference the Purchase Order requesting the repair.

### **Repairables 23**

External Repair.

Upon receipt of a Purchase Order the vendor repairs the material as per the agreed scope of work and returns it to site in time to meet the agreed delivery date.

### **Repairables 24**

External Repair.

Once the repaired material is received back on site it is available for inspection by the Repairables Coordinator. If the Repairables Coordinator determines the material has been repaired in accordance with the agreed scope of work, the Repair Purchase Order is receipted, with costs flowing back to the Refurbishment Work Order (not the material/Inventory).

The material is placed in inspection holding area until issued back from work order into inventory – see Repairables 25.


### **Repairables 25**

Materials issued back into inventory from Refurbishment Work Order as “REPAIRED”.

The material is issued nominating the Refurbishment Order number, the quantity and whether this is the final delivery (for multi item orders).

**Serialisation** – The serial Number for the Material is required to receipt it back into inventory.

### **Repairables 26**

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Refurbishment Work Order completed and costs settled.

## **4. REPAIRABLE NON-INVENTORY**

### **4.1. Un-Catalogued Spares**

#### **4.1.1. Scope**

This process is for the repair of Repairable Spares that are not catalogued, not managed as equipment or repaired internally.

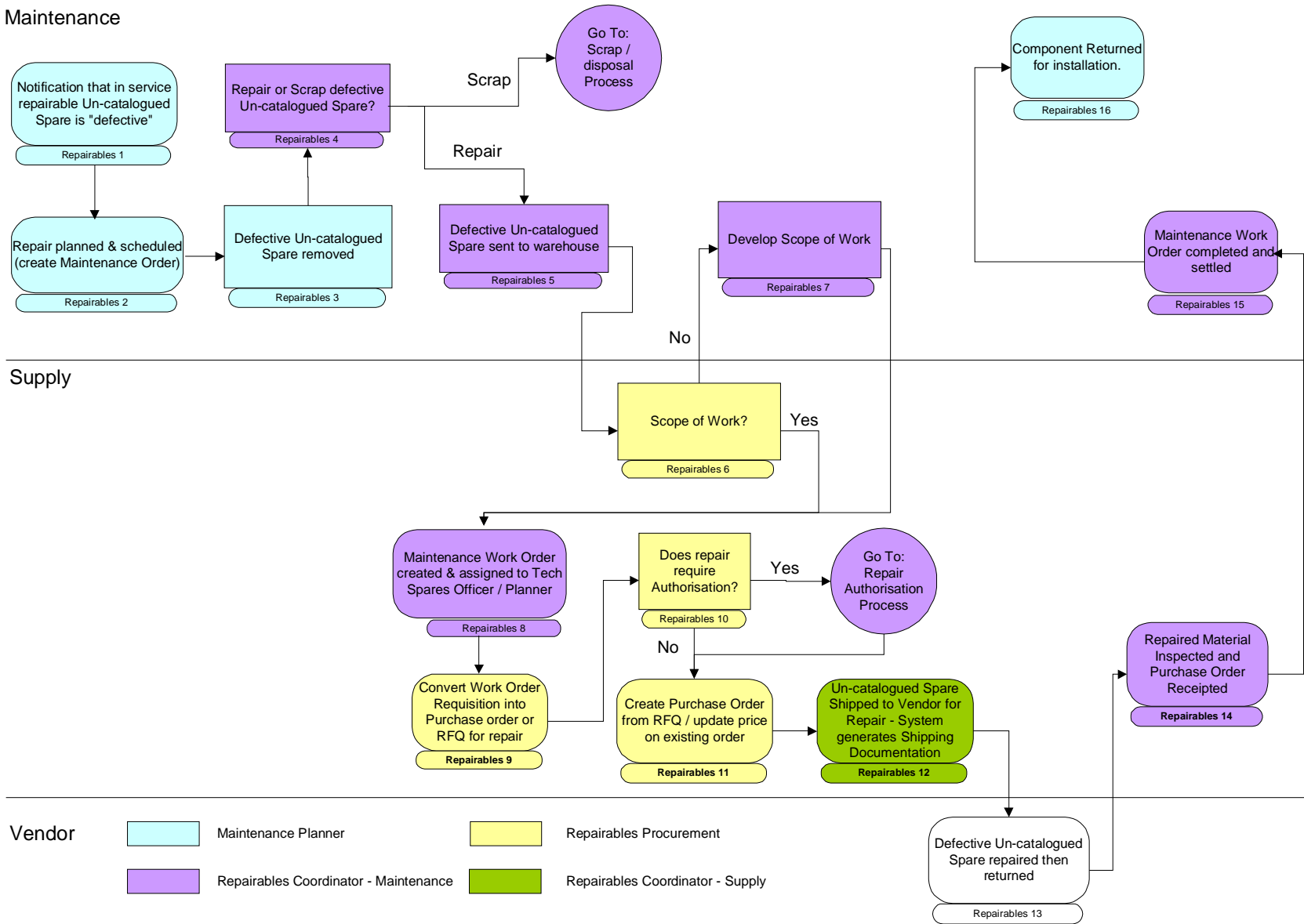
The process commences with the requirement to change out a malfunctioning Un-Catalogued Spare through to its repair and receipt on site.

Repairs for these items are initiated and managed via a Maintenance Work Order.

All catalogued items that are repairable should be stocked; this process does not include the repair of catalogued non-stocked repairable items.

### 4.1.2. Process Flow

#### Maintenance



## **Repairables 1**

A notification will be created to identify that an Un-Catalogued Spare is defective and needs to be changed out.

## **Repairables 2**

A Maintenance Order is created, planned and scheduled to carry out the work.

## **Repairables 3**

The work is carried out to remove the defective item.

## **Repairables 4**

Determine if the defective Un-Catalogued Spare is economical to repair. The condition of the Un-Catalogued Spare should be considered as well as the criticality and availability of a new replacement.

Note: this decision must be made with adequate knowledge of repair costs and procedures for that Un-Catalogued Spare.

Manufacturer and/or Vendor material may be available to assist in the technical evaluation of a component's suitability for repair i.e. Caterpillar Reusability Guidelines i.e. [Seal Wear Measurement \(Page 7\)](#) or [Engine Repair Management \(Page 15\)](#).

If there is any doubt then the item should be assumed repairable and returned to the store.

If the repairable Un-Catalogued Spare is uneconomical to repair it and must be scrapped as per operational scrapping and disposal procedures. Additionally, if the Un-Catalogued Spare is asset the asset register it must be updated to reflect the new scrapped status.

## **Repairables 5**

If the Un-Catalogued Spare is to be repaired then the Maintenance Practitioner must return the damaged item to the warehouse for shipment to the repair vendor.

Repairable Un-Catalogued Spare are to be returned to the warehouse with appropriate tagging, identifying the Un-Catalogued Spare and the Work Order on which it was changed out.

The damaged components must be returned to the warehouse in a condition suitable for storage, including the removal hazardous chemicals and in accordance with site environmental requirements i.e. hydraulic fluid drained, removal of excess oil, ports sealed etc...

## **Repairables 6**

Scopes of work are required for all repairs and must be made available to the repairer prior to quotation or work commencing.

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Scopes of work are to be sent to the repairer at time of transmission of Request For Quotation or Repair Purchase Order.

References to special or standard scopes of work, available for the repairer to download from an Internet site, may also be sent to the vendor.

Scopes of work may be negotiated with a repairer as part of a contract for the repair of the components, and therefore would not need to be sent with each order calling off that contract.

## Repairables 7

If there is no scope of work available for an item it must be developed prior to the repair work commences.

Supply & Maintenance should work co-operatively to develop appropriate scopes of work for each repairable material.

Resources available for Development of Scopes of work:

- An email addressed to [bhp-maint-mip](mailto:bhp-maint-mip) can be used to request details of any existing Scopes of Work for the specific repairable component from the BHPB Maintenance Community.
- Alternatively you can contact the GMN representative for your site as shown in the GMN Intranet link below:

[GMN Representative](#)

- BHPB Project Management Intranet Site:

<http://pdscoe.bhpbilliton.net/bb/home/home.asp>

## Repairables 8

A Maintenance Work Order is created and assigned to the appropriate planner to initiate and manage the repair of the Un-Catalogued Spare.

The repair of the Un-Catalogued Spare is planned as an external operation in the Maintenance Work Order; this will generate a Purchase Requisition for the Repair of the component.

Implementation of a contract with a Vendor for the repair of the Un-Catalogued Spare will allow automatic conversion of these purchase requisitions into Repair Purchase Orders.

*Warranty: At the time of the creation of this Repair Maintenance Work Order the planner should be notified of any valid Warranty that exists on the repairable item. This will allow the planner to ensure the remainder of the repair process is subject to any operational warranty requirements.*

## Repairables 9

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The free text requisition generated by the Work Order for the repair of the Un-Catalogued Spare, unless automated by a contract, will now require conversion into a Purchase Order or a request for quote (RFQ).

Depending on the nature of the Un-Catalogued Spare there are two options:

- Create a RFQ for the repair – where the repair does not require the component sent to them for inspection before they can quote;
- Create a Purchase Order with an estimated price, which is updated once the vendor has had the opportunity to examine item and quote on the repair.

### **Repairables 10**

Authorisation of repair should only be required only for an item where cost to repair exceeds 70% of purchase price of new replacement or over a certain value, as determined by operational requirements.

The authorisation process should be via an electronic workflow that allows expediting of outstanding approvals.

### **Repairables 11**

The approved requisition (from the RFQ process) needs to be converted into a purchase order.

If Purchase Order has already been sent with an estimated price, the correct price must be updated (after authorisation where required) prior to goods receipt.

### **Repairables 12**

The damaged Material is sent to the Vendor for repair.

Transport Details (i.e. Consignment Note) are entered as part of the creation of system based Shipping Documentation.

A copy of the Shipping Documentation should print in warehouse with an additional copy emailed to the vendor.

The Shipping Documentation should detail the transportation arrangements, clearly identify the Material and reference the Purchase Order requesting the repair.

### **Repairables 13**

Upon receipt of a Purchase Order the vendor repairs the Un-Catalogued Spare, as per the agreed scope of work, and returns to site in time to meet the agreed delivery date.

Off-site inspections may be required for high value, critical items as per the scope of work.

### **Repairables 14**

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Purchase Order receipted via standard receipt process.

### **Repairables 15**

Maintenance Work Order completed and settled.

### **Repairables 17**

Un-Catalogued Spare returned to maintenance for installation.

Repairable items that will not be returned to service immediately, but are placed in storage should be catalogued and managed as inventory.

## **5. ROLES & RESPONSIBILITIES**

### **5.1. Overview**

This leading practice has identified certain Roles that are required to make the recommended business processes work. These Roles are simply groupings of tasks that naturally sit together and within the same function i.e. Maintenance or Supply.

These Roles are not positions, as one position may perform multiple or partial roles.

Due to the complex nature of Repairables management, operations that have implemented leading practice tend to combine the Maintenance Repairables Coordinator and the Repairables Inventory Management roles into a single position - a Technical Spares Officer. This gives responsibility to one person/group for all the key decision points of the process.

### **5.2. Maintenance**

#### Maintenance Planner

- Create notification – repairable component is defective
- Create/Plan & Schedule Maintenance Work Order to replace defective repairable component/material
- Create reservation for “NEW” or “REPAIRED” replacement.
- Create/Plan & Schedule Repair Maintenance Work Orders for repair of non-inventory components.
- Complete and settle Repair Maintenance Work Orders
- Nominate/determine if warranty is applicable

#### Repairables Coordinator

- Return Damaged Materials to Warehouse
- Ensure damaged materials/components are correctly tagged and cleaned
- Maintain Equipment Master
- Coordinate Maintenance of Asset Register
- Liase with Repairables Coordinator – Supply, to track movement of repairable components/materials

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- Facilitate the “Repair or Scrap” decision
- Authorisation of repair of components where cost to repair exceeds 70% of purchase price of new replacement or over a certain value, as determined by operational requirements.
- Develop of scopes of work for repairable components/materials
- Create/Plan & Schedule Refurbishment Work Orders and reservations for damaged items
- Inspect Repairs to ensure compliance with agreed scopes of work
- Receipt Repair Purchase order from Refurbishment & Repair Work Orders
- Return materials to inventory from Refurbishment Work Orders
- Complete and settle Refurbishment Work Orders

### 5.3. Supply

#### Repairables Coordinator

- Follow up damaged components/materials not returned to warehouse
- Scrapping of material from inventory
- Manage Damaged Inventory
- Goods Receipt of Damaged materials into “DAMAGED” Inventory
- Issue “DAMAGED” materials to sub-contract Purchase Orders and/or Refurbishment Work Orders
- Ship components/materials to preferred Vendor for repair via system generated shipping documents
- Notify Maintenance Repairables Coordinator of arrival of repaired items on site ready for inspection
- Check identification tag matches component
- Check stock on hand max/min
- Check item in GSAP for material number

#### Repairables Procurement

- Determines if Scope of work exists
- Works with Repairables Coordinator – Maintenance, to develop of scopes of work for repairable components/materials.
- Converts requisitions into RFQ or Repair Purchase Orders
- Initiates approval process for components/materials where cost to repair exceeds 70% of purchase price of new replacement or over a certain value, as determined by operational requirements.
- Creates Repair Purchase Orders from approved RFQ; or updates estimated price on Repair Purchase Order with actual repair value (after approval where required).
- Purchases new replacement component/material where required – i.e. no damaged stock available to repair.
- Implements System Contracts (Outline Agreements/FPAs) for repair of materials
- Manages/implements Vendor managed catalogues for the repair of components/materials.
- Resolves Invoice discrepancies for Repair Purchase Orders

- Ensure warranty is managed where required (i.e. maintenance planner to initiate)

### Repairables Inventory Management

- Review MRP requisitions for Repairable materials – is there damaged stock available for repair?
- Is material managed as equipment or repaired internally? Sub-contract Purchase Order or Refurbishment Work Order
- Manage MRP Settings for Repairable Materials
- Create and Maintain Material Bill Of Materials (BOM) for repairable materials

## 6. KEY PERFORMANCE INDICATORS

### 6.1. Overview

This leading practice has identified a number of Key Performance Indicators (KPIs) that may be used to measure the Efficiency and Effectiveness of the recommended business processes.

These KPIs are listed as measures of Efficiency or measures of Effectiveness, as per the Dynamic Strategy Framework below:

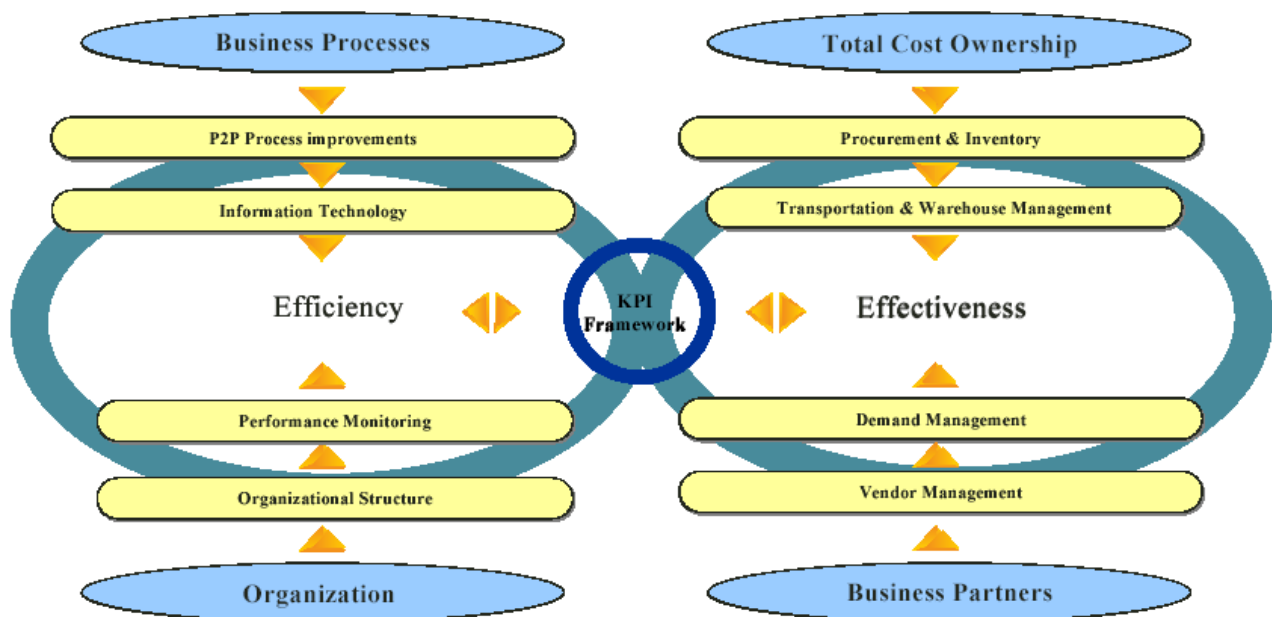


Diagram 1 – Dynamic Strategy Framework

### 6.2. Efficiency

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### 6.2.1. Business Processes

#### *P2P Process Improvements*

- Value & Number (% of line items) of Repair orders initiated by Material Requirements Planning (MRP) process.
- Value & Number (% of line items) of Repair Purchase Orders generated automatically.
- Value & Number (% of line items) of Repair Purchase Orders automatically expedited.
- Value & Number (% of line items) of Repair Purchase Orders paid via Evaluated Receipt Settlement (ERS) / Payment on Receipt or Electronic Invoice.

#### *Information Technology*

- Value & Number (% of line items) of Repair Purchase Orders electronically sent to vendor.
- Value & Number (% of line items) of Repair Purchase Orders electronically confirmed by Vendor – Repair Price, Delivery Date, Part/Service Number.
- Value & Number (% of line items) of Repair Purchase Orders electronically receiving Advanced Shipping Notification (ASN).
- Number (% of line items) of Scopes of Work for Repair Purchase Orders sent or available electronically.
- **This KPI is included to start discussion/examination of this requirement.**

Number (% of line items) for which repair maintenance data is electronically received from the vendor i.e. failure analysis, recommendation to scrap


### 6.2.2. Organisation

#### *Organisational Structure*

- Number (% of line items) of repair orders requiring approval, approved via system based workflow.

#### *Performance Monitoring*

- Average number of days (12 month Trend) for damaged items to be issued to Sub-Contract Purchase Order.

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- MRP Requisition release cycle time (6 month Trend)
- Repair requisition to Repair Purchase Order Cycle time (6 month Trend)

## 6.3. Effectiveness

### 6.3.1. Total Cost of Ownership

#### *Procurement & Inventory*

- Value & Number (% of line items) of Repair Purchase Orders covered by contracts - ERP or Vendor Managed Catalogues.
- Value & Number (% of line items) of Repair Purchase Orders with scopes of work.
- Value & Number (% of line items) of Repairs completed outside recommended repairables process.
- Value of Repairable Inventory (12 month Trend).

#### *Transportation & Warehouse Management*

- Average number of days (12 month Trend) for damaged items to be receipted back into "DAMAGED" stock.
- Number of outstanding damaged items not yet receipted back into "DAMAGED" stock.
- Number (% of line items) of components/materials transported to repairer with System generated shipping documentation.

### 6.3.2. Business Partners

#### *Vendor Management*

- Mean Time Between Failure (MTBF) of repaired components – monitor quality of repairs.
- Number of active Repair Vendors (12 month trend)
- Number of Contracted Repair Vendors
- Distribution of Spend with active Repair Vendors (YTD)

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## 7. REPORTING

### 7.1. Overview

In addition to the KPI reporting detailed above, this leading practice requires a number of system-generated reports to support the recommended business processes.

These reports act as both proactive and reactive controls to ensure critical steps in the business processes are executed correctly. They assist in coordinating the required activities between the various functions and roles.

### 7.2. Recommended Reports

Report / Purpose:	Frequency:	Role:
<p><i>Damaged Stock Management</i> – This report should detail all goods movements of repairable materials.</p> <p>Primarily this report will assist in determining when a damaged item is expected to be returned to the warehouse and whether or not this has occurred.</p>	Daily	Repairables Coordinator – Supply & Maintenance
<p><i>Damaged Stock Shipment</i> - This report should list Repair Purchase Orders that have been created that require issue of damaged stock.</p> <p>Sub-contract Purchase Orders may be issued with damaged stock, which can be seen in the inventory system as damaged stock with Vendor.</p> <p>Automation of Repair Purchase Orders will result in the repair vendor receiving the purchase order immediately after the Repair Inventory controller releases the requisition (after they have determined that damaged stock is available for repair).</p> <p>This report communicates to the warehouse the need to issue the damaged stock to the purchase order for repair.</p>	Daily	Repairables Coordinator – Supply
<p><i>Material Managed as Equipment</i> – This report should be run online/as required to</p>	As required	Repairables Inventory Management

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assist the Repairables Inventory Management role in determining if a material is managed as Equipment.		
<p><i>Material Scrapped</i> – This report details materials that have been scrapped out of the inventory management system that are also managed as Equipment or on the asset register.</p> <p>The purpose of this report is to prompt the maintenance of the Equipment Master and Asset register to reflect the decision to scrap an item.</p>	Daily	Repairables Coordinator – Maintenance

## 8. SCOPES OF WORK

### 8.1. Overview

Leading Practice in Repairables Management includes the utilisation of Scopes of work for the repair of repairable spares.

Scopes of work should be available to Repairers at the time of Request for Quote and/or receipt of the Repair Purchase Order.

They should also be used as part of the inspection of repaired spares returned to site prior to them being receipted – to ensure the repair has been in accordance with the Scope of Work.


Many Manufacturers/OEMs provide scopes of work with detailed technical specifications; these should be used where available, adapted to local requirements.

Generic Scopes of work may be included in Maintenance planning tools such as Task Lists, Bills of Materials (BOM) or Application Parts Lists (APL) available for use in Refurbishment or Repair Work Orders.

Scopes of Work should form the basis of fixed price contracts for the repair of Materials; these contracts will allow automation of the Repair Purchase Order referencing the contract and the relevant Scope of Work.

Supply & Maintenance should work co-operatively to develop appropriate scopes of work for each repairable material.

### 8.2. Resources

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Resources available for Development of Scopes of work:

- An email addressed to [bhp-maint-mip](mailto:bhp-maint-mip) can be used to request details of any existing Scopes of Work for the specific repairable component from the BHPB Maintenance Community.
- Alternatively you can contact the GMN representative for your site as shown in the GMN Intranet link below:

[GMN Representative](#)

- BHPB Project Management Intranet Site:

<http://pdscoe.bhpbilliton.net/bb/home/home.asp>