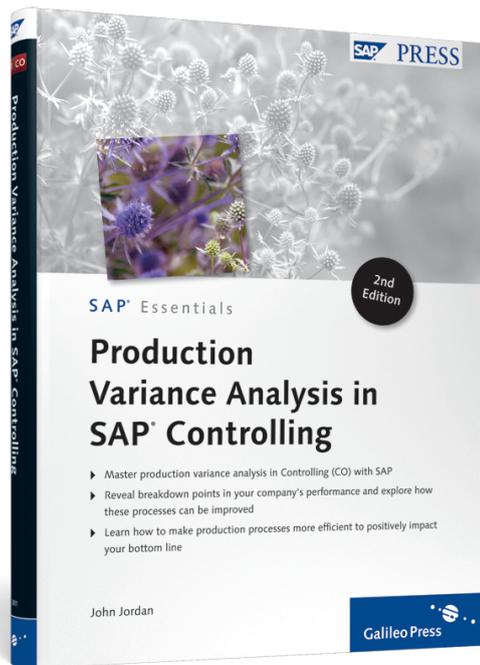


John Jordan

Production Variance Analysis in SAP® Controlling



 Galileo Press®

Bonn • Boston

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5 Scrap Variance

In Chapter 4, we analyzed all scrap categories in detail, except for scrap variance. Processing scrap and analyzing scrap variances has its own chapter because there is more involved in master data settings and cost estimate analysis than in any of the other variance categories.

In this chapter, we'll analyze scrap processing and scrap variance analysis in detail. We'll discuss scrap basics, types of scrap, and master data settings; carry out plan and actual scrap postings; and then analyze scrap postings in detailed reports. The method we use for analyzing scrap variance in this chapter can be used as a model for analyzing variances in general.

5.1 Scrap Basics

Because no production process is perfect, there is always some percentage of scrap produced. Assemblies or components that do not meet quality standards may either become scrap or require rework. Depending on the problem, cheaper items may become scrap, while more costly assemblies may justify rework.

Case Scenario

The mounting holes for a metal plate are accidentally drilled larger than they were supposed to be. Filling the holes with weld and re-drilling correctly sized holes would cost more than the plate is worth. The plate is scrapped, and a new plate is drilled correctly and delivered to inventory. Statistics show that 1 in every 10 plates is drilled incorrectly, so you plan 10% assembly scrap for the drilled metal plate.

A drilled metal plate is issued from inventory as a component in a higher-level assembly, and during inspection, before production use, the mounting holes are found to be oversize. The plate is discarded, and another plate is issued from inventory. Statistics show that 1 in every 50 drilled plates issued from inventory is drilled incorrectly and discarded, so you plan 2% component scrap for the drilled metal plate.

You enter both 10% assembly scrap and 2% component scrap in the material master MRP views of the drilled plate.

If the plates were made of an expensive metal alloy that is not readily available, it may be cost effective to rework the oversize holes by welding and re-drilling. In this case, you do not plan scrap.

Scrap is different from other losses during the manufacturing of a product because it can be analyzed and predicted. You can enter and store known scrap amounts in master data as planned scrap percentages. Scrap percentages increase the planned manufacturing costs of a product, via the released cost estimate and standard price. If actual scrap equals planned scrap, no variance occurs because postings are as planned. Benefits of planning for scrap include the following:

- ▶ Margin analysis is more accurate.
- ▶ Variances highlight processes that need analysis.
- ▶ Production resources can be more accurately planned.
- ▶ Cost of sales more accurately reflect manufacturing costs.

Target and actual scrap costs are calculated from *plan* scrap quantity and *actual* scrap quantity posted during activity confirmation. Scrap variance is calculated and subtracted from total variances and is displayed in a scrap variance column in cost reports. A requirement to display the scrap variance column is to activate scrap calculation and reporting in the variance key and variance variant, as we examined in Chapter 4.

There are three different types of scrap that can be planned for:

- ▶ **Assembly scrap**
This includes the entire cost of faulty or lost assemblies in the cost of sales. The plan quantity of the assembly is increased.
- ▶ **Component scrap**
This includes the cost of faulty or lost individual components in the cost of sales. The plan quantity of components is increased.
- ▶ **Operation scrap**
This optimizes the use of valuable components. The plan quantity of components in subsequent operations is decreased.

Now that we've covered scrap basics, let's discuss each of the three different types of scrap in detail.

5.2 Assembly Scrap

Assembly scrap includes the entire cost of faulty or lost assemblies in the cost of sales. If assembly scrap is not planned, all scrap costs post in other variance categories. Although variance can be included at a higher level in profitability reporting, planned assembly scrap is included at the material or gross profit level, as we discussed in Chapter 3. This results in more accurate analysis of profitability at the product level.

5.2.1 Assembly Scrap Definition

Assembly scrap can be defined as the percentage of assembly quantity that does not meet required production quality standards. For example, planned assembly scrap of 25% means that in order to deliver 100 pieces of an assembly, you plan to produce 125. Planned assembly scrap also improves the MRP process by ensuring you start with an increased quantity in order to achieve the required product yield. Assembly scrap is considered an *output* scrap because it affects the planned output quantity of items in the production process.

5.2.2 Effect of Assembly Scrap on Quantities

Scrap quantities are important because they cause scrap values. Let's follow a simple example of how assembly scrap applied at the assembly level affects lower-level component and activity quantities.

Example

You plan to produce 100 finished printed circuit boards (PCBs). If planned assembly scrap is entered for the finished PCBs, all component and activity quantities are increased by 10%, as highlighted in the QUANTITY COSTED column in Figure 5.1.

	Quantity no scrap	Quantity costed	Assembly scrap
Finished PCBs	100 PC	100 PC	0 PC
Blank PCBs	100 PC	110 PC	10 PC
BIOS	100 PC	110 PC	10 PC
Operation 1	100 h	110 h	10 h
Processor	100 PC	110 PC	10 PC
Operation 2	100 h	110 h	10 h

Figure 5.1 Effect of Assembly Scrap on Component and Activity Quantities

By increasing the quantity of components and activities, assembly scrap increases the plan cost of producing the finished PCBs. MRP will propose a production quantity of 110 PC (pieces), with the expectation that 100 PC will be delivered to inventory, and 10 PC will be confirmed as scrap.

Now that we know what assembly scrap is and how it affects scrap quantities, we'll investigate how to plan assembly scrap in the next section.

5.2.3 Assembly Scrap Master Data

You can plan assembly scrap in two different master data fields. The most commonly used field is located in the MRP 1 view of the material master, which you access with Transaction MM02 or via menu path LOGISTICS • MATERIALS MANAGEMENT • MATERIAL MASTER • MATERIAL • CHANGE • IMMEDIATELY. Click on the MRP 1 tab to display the screen shown in Figure 5.2.

Lot size data		
Lot size	Z4	20 day Lot (4 Working Weeks)
Minimum lot size		Maximum lot size
Fixed lot size		Maximum stock
Ordering costs		Storage costs
Assembly scrap (%)	10.00	Takt time

Figure 5.2 Assembly Scrap Field in MRP 1 View

Fill in the ASSEMBLY SCRAP (%) field with a flat rate percentage determined by your production statistics of scrap rates, which is 10.00% in this example. You should update this field prior to each costing run if the statistics change during the current year. Later, in Section 5.2, we'll examine how assembly scrap affects standard cost estimates.

Another master data field that controls assembly scrap is located in the BASIC DATA tab of a BOM item. You can view or change BOM item details with Transaction CS02 or via menu path LOGISTICS • PRODUCTION • MASTER DATA • BILLS OF MATERIAL • BILL OF MATERIAL • MATERIAL BOM • CHANGE. Double-click on a BOM item to display BOM item details, as shown in Figure 5.3.

The screenshot shows the SAP BOM Component Data Entry screen. It is divided into two main sections: 'BOM item' and 'Quantity Data'.
 In the 'BOM item' section, the following fields are visible:
 - Item Number: 0290
 - Component: SP1000 (with a 'Split Pin' checkbox)
 - Item category: L Stock item
 - Item ID: 00000029
 - Sort string: (empty field)
 - Sub-item ID: (checkbox, unchecked)
 In the 'Quantity Data' section, the following fields are visible:
 - Quantity: 2.000 (with 'EA' units)
 - Fixed quantity: (checkbox, unchecked)
 - Operation scrap in %: (empty field, with a 'Net ID' checkbox)
 - Component scrap (%): (empty field)

Figure 5.3 Inspect Net ID Indicator of BOM Component

You can select the NET ID checkbox to ignore assembly scrap for this component. This is useful if you need to enter a scrap percentage for a particular component that is different from the assembly scrap percentage of the assembly. In this case, select the NET ID checkbox, and fill in the percentage scrap for the component in either the OPERATION SCRAP IN % or COMPONENT SCRAP (%) fields. If you make an entry in the COMPONENT SCRAP (%) field without selecting the NET ID checkbox, assembly scrap is calculated first, and then component scrap is calculated in addition, as discussed in detail in Section 5.3.

5.2.4 Planned Assembly Scrap Costs

Planned assembly scrap costs are included in the standard cost estimate. Let's compare two cost estimates, one *without* assembly scrap, and one *with* assembly scrap, to highlight the difference. To display the screen shown in Figure 5.4, use Transaction CK13N or menu path ACCOUNTING • CONTROLLING • PRODUCT COST CONTROLLING • PRODUCT COST PLANNING • MATERIAL COSTING • COST ESTIMATE WITH QUANTITY STRUCTURE.

Costing structure	E...	Total value	Scrap	Currency	Quantity	Scrap quantity	U...	Resource
STANDARD FG	⊕	46,254.68	0.00	USD	1,000.000	0.000	EA	1303 100010682
PRIMER	⊕	227.44	0.00	USD	7.000	0.000	GAL	1303 400000691
SFG	⊕	23,271.40	0.00	USD	1,000.000	0.000	EA	1303 300002252
URETHANE A 16	⊕	6,155.17	0.00	USD	6,034.483	0.000	LB	1303 400000693
MDI ISO B MATERIAL	⊕	1,525.52	0.00	USD	965.517	0.000	LB	1303 400000694

Figure 5.4 Cost Estimate without Assembly Scrap

The TOTAL VALUE of the STANDARD FG cost estimate *without* assembly scrap is 46,254.68. The figures in the SCRAP and SCRAP QUANTITY columns indicate there is no planned output scrap. Now let's display a cost estimate for material STANDARD FG with 10% assembly scrap planned, as shown in Figure 5.5.

Costing structure	Total value	Scrap	Currency	Quantity	Scrap quantity	U...	Resource
STANDARD FG	50,880.14	0.00	USD	1,000.000	0.000	EA	1303 100010682
PRIMER	250.19	22.74	USD	7.700	0.700	GAL	1303 400000691
SFG	25,598.54	2,327.14	USD	1,100.000	100.000	EA	1303 300002252
URETHANE A 16	6,770.69	615.52	USD	6,637.932	603.448	LB	1303 400000693
MDI ISO B MATERIAL	1,678.07	152.55	USD	1,062.069	96.552	LB	1303 400000694

Figure 5.5 Cost Estimate with Assembly Scrap

The TOTAL VALUE of the STANDARD FG cost estimate *with* assembly scrap is 50,880.14, which is 10% higher than the cost estimate *without* assembly scrap. This is because the quantity of all components has increased by 10%, illustrated by comparing the QUANTITY columns in both cost estimates. The increase in component quantities is shown in the SCRAP QUANTITY column, while the corresponding increase in value is shown in the SCRAP column. While only material cost estimates are displayed in Figure 5.5, the quantity and value of all other cost estimate items, such as activities, are also increased by 10%.

Tip

To quickly determine if assembly scrap is included in a cost estimate, click on the cost estimate QTY STRUCT. (quantity structure) tab, which displays the screen shown in Figure 5.6.

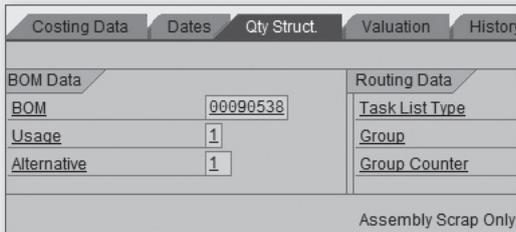


Figure 5.6 "Assembly Scrap Only" Text in Cost Estimate

The ASSEMBLY SCRAP ONLY text indicates assembly scrap is included in the cost estimate, without the need to refer to the MRP 1 view of the material master. Information text also appears in the same tab if operation scrap is included in the cost estimate, as discussed later in Section 5.4.

Now that we've looked at planning for assembly scrap with master data entries and the effect on cost estimates, let's examine how actual scrap postings occur.

5.2.5 Actual Assembly Scrap Costs

Actual scrap costs usually occur during production order activity confirmation. This is when activities are confirmed, and goods movements occur during backflushing and auto goods receipt, as discussed in detail in Chapter 3. We'll now create a production order and carry out a confirmation to demonstrate how actual assembly scrap costs occur.

You create a production order with Transaction CO01 or via menu path LOGISTICS • PRODUCTION • PRODUCTION CONTROL • ORDER • CREATE • WITH MATERIAL. The screen shown in Figure 5.7 is displayed.

The screenshot shows the SAP Production Order header for Order 10048503, Material 100010682, and Plant 1303. The 'Quantities' section is expanded, showing a total quantity of 1,100.000 (EA) and a scrap portion of 100.000 (10.00%). The delivered quantity is 0.000 and the expected yield variance is 0.000.

Quantities			
Total quant.	1,100.000	EA	Scrap portion 100.000 10.00 %
Delivered	0.000		ExpectYieldVar 0.000

Figure 5.7 Production Order Quantity Increased by Planned Assembly Scrap

The production order quantity is automatically increased by 10% due to assembly scrap in the material master MRP 1 view, as discussed in Section 5.2. MRP proposes a total quantity of 1,100.000, as shown in the TOTAL QUANT. field, even though only 1,000.000 are required. This is because a confirmed scrap assembly quantity of 100.000 is expected, as shown in the SCRAP PORTION field.

Actual assembly scrap is posted during production order confirmation. In Chapter 3, we saw a confirmation per operation. In this example, we'll follow a confirmation at the order header level with Transaction CO15 or via menu path LOGISTICS • PRODUCTION • PRODUCTION CONTROL • CONFIRMATION • ENTER • FOR ORDER. The screen shown in Figure 5.8 is displayed.

Goods movements

Order: 10048545 Status: REL MACM PCC
 Material no.: 100010682 STANDARD FG

Partial conf.
 Final conf.
 Aut.fin.confirm
 Clear open reservs.

Actual data	Current confirm.	Un.	Already confirmed	Total to confirm	Un.
Yield to conf.	1,000.000	EA	0.000	1,000.000	EA
Confirmed scrap	100.000		0.000	100.000	
Rework			0.000		
Reason					

Figure 5.8 Confirmation Screen and Confirmed Scrap Field

A quantity of 100.000, due to planned assembly scrap, defaults in the CONFIRMED SCRAP field in the CURRENT CONFIRM. column. If the default CONFIRMED SCRAP quantity is manually changed, a scrap variance will result. The expected scrap quantity of 100.000 is displayed in the TOTAL TO CONFIRM column of the CONFIRMED SCRAP row.

After scrap is confirmed, you will carry out variance calculation next, as we will discuss in the following section.

5.2.6 Variance Calculation

You carry out variance calculation with Transactions KKS6 (individual) and KKS5 (collective) or via menu path ACCOUNTING • CONTROLLING • PRODUCT COST CONTROLLING • COST OBJECT CONTROLLING • PRODUCT COST BY PERIOD • PERIOD-END CLOSING • SINGLE FUNCTIONS: PRODUCT COST COLLECTOR • VARIANCES. The screen shown in Figure 5.9 is displayed following variance calculation.

Note

You carry out variance analysis for production and process orders with Transactions KKS2 (individual) and KKS1 (collective).

Target cst	Σ	Act. costs	Σ	Ctrl costs	Σ	Variance	Σ	Scrap	Σ	Rem. var.	Σ	Actual qty
46,254.68		50,880.14		46,254.66		0.02-		4,625.48		0.00		1,000.000
46,254.68		50,880.14		46,254.66		0.02-		4,625.48		0.00		

Figure 5.9 Variance Calculation Scrap Output Screen

Assembly scrap maintains the expected ACTUAL QTY (last column) delivered to inventory at 1,000.000 by increasing the manufactured quantity. After the planned assembly scrap quantity is actually confirmed as scrap, the output quantity is the quantity required.

The unfavorable SCRAP variance of 4,625.48 indicates that assembly scrap was posted but not planned for in this example. SCRAP variance is subtracted from total variance during variance calculation, which simplifies the task of analyzing total variance. Click on the SCRAP button (not shown) in the variance calculation output screen to display details of the scrap variance by cost element and operation.

Now that we've examined how to plan and post actual scrap and calculate variance, let's look at how to report and analyze scrap postings.

5.2.7 Assembly Scrap Target/Actual

During a period, or at period end, you may need to carry out further detailed analysis of scrap variance. Before doing so, you should first run a variance calculation to determine the target costs. You can display and analyze target versus actual costs in detailed product cost collector reports with Transaction PKBC_PKO or via menu path ACCOUNTING • CONTROLLING • PRODUCT COST CONTROLLING • COST OBJECT CONTROLLING • PRODUCT COST BY PERIOD • INFORMATION SYSTEM • REPORTS FOR PRODUCT COST BY PERIOD • DETAILED REPORTS. A similar report is available for production and process orders with Transaction PKBC_ORD.

Let's compare a series of three detailed reports to demonstrate how assembly scrap affects variance.

Assembly Scrap Not Planned and Actual Scrap Posted

The first detailed report contains an unfavorable scrap variance because assembly scrap is not planned, while actual scrap is posted, as shown in Figure 5.10.

Because assembly scrap is not planned, actual assembly scrap posts as an unfavorable scrap variance with a value of 4,625.48, as shown in the SCRAP column.

Transact.	Origin	Origin (Text)	Σ Total tgt	Σ Ttl actual	Σ Variance	Σ Scrap	Total act.qty
Confirmations	1303B-5420/LABOR	Production / Labor Hours	4,578.48	5,036.32	457.84	457.85	255.521
	1303B-5420/OVHD	Production / Overhead Hours	6,027.98	6,630.77	602.79	602.80	255.521
	1303B-5420/MNT	Production / Maintenance Hours	3,349.65	3,684.61	334.96	334.97	255.521
	1303B-5420/ELEC	Production / Electricity	770.99	848.09	77.10	77.10	5,848.910
	1303B-5420/NATGAS	Production / Natural Gas	348.05	382.86	34.81	34.81	957.151
Goods issues	1303/400000691	PRIMER	227.44	250.19	22.75	22.74	7.700
	1303/400000693	URETHANE A 16	6,155.17	6,770.69	615.52	615.52	6,637.931
	1303/400000694	MDI ISO B MATERIAL	1,525.52	1,678.07	152.55	152.55	1,062.069
	1303/300002252	SFG	23,271.40	25,598.54	2,327.14	2,327.14	1,100.000
Debit			■ 46,254.68	■ 50,880.14	■ 4,625.46	■ 4,625.48	
Goods receipt	1303/100010682	STANDARD FG	46,254.68-	46,254.68-	0.00	0.00	1,000.000-
Delivery			■ 46,254.68-	■ 46,254.68-	■ 0.00	■ 0.00	
			■ ■ 0.00	■ ■ 4,625.46	■ ■ 4,625.46	■ ■ 4,625.48	

Figure 5.10 Assembly Scrap Not Planned and Actual Scrap Posted

Activity and component quantities to make 1,100.000 STANDARD FG are issued from inventory, as shown in the TOTAL ACT.QTY column. This corresponds to the value of 50,880.14 in the DEBIT row and TTL ACTUAL (total actual costs) column.

A quantity of 1,000.000 STANDARD FG is delivered to inventory, as shown in the TOTAL ACT.QTY (last) column. This corresponds to the credit value of 46,254.68 in the DELIVERY row and TTL ACTUAL column.

Because the total actual debits of 50,880.14 are greater than the total actual credits of 46,254.68, an unfavorable variance of 4,625.46 results, as shown in the summary (last) row of the TOTAL ACTUAL column.

Now that we've looked at how posting assembly scrap without planning for it results in an unfavorable variance, let's see the consequences of planning but not posting assembly scrap.

Assembly Scrap Planned and Actual Scrap Not Posted

Compare the report in the previous section with an *unfavorable* scrap variance to a report in this section with a *favorable* scrap variance that results from planning but not posting assembly scrap, as shown in Figure 5.11.

Because assembly scrap is planned, all planned scrap that is not actually posted results in a favorable scrap variance, with a value of 4,625.50- as seen in the SCRAP column in Figure 5.11.

Transact.	Origin	Origin (Text)	Σ Total tgt	Σ Ttl actual	Σ Variance	Σ Scrap	Total act.qty
Confirmations	1303B-5420/LABOR	Production / Labor Hours	5,036.32	4,578.48	457.84-	457.85-	232.292
	1303B-5420/OVHD	Production / Overhead Hours	6,630.77	6,027.98	602.79-	602.80-	232.292
	1303B-5420/MNT	Production / Maintenance Hours	3,684.61	3,349.65	334.96-	334.97-	232.292
	1303B-5420/ELEC	Production / Electricity	848.09	770.99	77.10-	77.10-	5,317.191
	1303B-5420/NATGAS	Production / Natural Gas	382.86	348.05	34.81-	34.81-	870.137
Goods issues	1303/400000691	PRIMER	250.19	227.44	22.75-	22.74-	7.000
	1303/400000693	URETHANE A 16	6,770.69	6,155.17	615.52-	615.52-	6,034.483
	1303/400000694	MDI ISO B MATERIAL	1,678.07	1,525.52	152.55-	152.55-	965.517
	1303/300002252	SFG	25,598.54	23,271.40	2,327.14-	2,327.16-	1,000.000
Debit			■ 50,880.14	■ 46,254.68	■ 4,625.46-	■ 4,625.50-	
Goods receipt	1303/100010682	STANDARD FG	50,880.14-	50,880.14-	0.00	0.00	1,000.000-
Delivery			■ 50,880.14-	■ 50,880.14-	■ 0.00	■ 0.00	
			■ ■ 0.00	■ ■ 4,625.46-	■ ■ 4,625.46-	■ ■ 4,625.50-	

Figure 5.11 Assembly Scrap Planned and Actual Scrap Not Posted

Activity and component quantities needed to make 1,000.000 STANDARD FG are issued from inventory, as shown in the TOTAL ACT.QTY (last) column. This corresponds to the value of 46,254.68 in the DEBIT row and TTL ACTUAL (total actual) costs column.

A quantity of 1,000.000 STANDARD FG is delivered to inventory, as shown in the TOTAL ACT.QTY column. This corresponds to the credit value of 50,880.14- in the DELIVERY row and TTL ACTUAL column. The credit value is based on the standard cost estimate, which contains the costs for making 1,100 assemblies, because assembly scrap is planned.

Because total actual debits of 46,254.68 are less than the total actual credits of 50,880.14, a favorable variance of 4,625.46- is shown in the summary (last) row of the TOTAL ACTUAL column.

Now that we've looked at how posting assembly scrap without planning for it results in an unfavorable variance, and how planning assembly scrap and not actually posting it results in a favorable variance, let's see the effect of both planning and posting assembly scrap.

Assembly Scrap Planned and Actual Scrap Posted

Compare the reports in the previous two sections with unfavorable and favorable scrap variances to the report in this section with no scrap variance, which results from planning assembly scrap and posting actual scrap, as shown in Figure 5.12.

Transact.	Origin	Origin (Text)	Σ Total tgt	Σ Ttl actual	Σ Variance	Σ Scrap	Total act.qty
Confirmations	1303B-5420/LABOR	Production / Labor Hours	5,036.32	5,036.32	0.00	0.00	255.521
	1303B-5420/OVHD	Production / Overhead Hours	6,630.77	6,630.77	0.00	0.01-	255.521
	1303B-5420/MNT	Production / Maintenance Hours	3,684.61	3,684.61	0.00	0.00	255.521
	1303B-5420/ELEC	Production / Electricity	848.09	848.09	0.00	0.00	5,848.910
	1303B-5420/NATGAS	Production / Natural Gas	382.86	382.86	0.00	0.00	957.151
Goods issues	1303/400000691	PRIMER	250.19	250.18	0.01-	0.00	7.700
	1303/400000693	URETHANE A 16	6,770.69	6,770.69	0.00	0.01-	6,637.931
	1303/400000694	MDI ISO B MATERIAL	1,678.07	1,678.07	0.00	0.00	1,062.069
	1303/300002252	SFG	25,598.54	25,598.54	0.00	0.02-	1,100.000
Debit			■ 50,880.14	■ 50,880.13	■ 0.01-	■ 0.04-	
Goods receipt	1303/100010682	STANDARD FG	50,880.14-	50,880.14-	0.00	0.00	1,000.000-
Delivery			■ 50,880.14-	■ 50,880.14-	■ 0.00	■ 0.00	
			■ ■ 0.00	■ ■ 0.01-	■ ■ 0.01-	■ ■ 0.04-	

Figure 5.12 Assembly Scrap Planned and Actual Scrap Posted

Because assembly scrap is planned and actual scrap is posted, only rounding differences of 0.04- remain in the SCRAP variance column.

Activity and component quantities needed to make 1,100.000 STANDARD FG are issued from inventory, as shown in the SFG row and TOTAL ACT.QTY column. This corresponds to the value of 50,880.13 in the DEBIT row and TTL ACTUAL (total actual costs) column.

A quantity of 1,000.000 STANDARD FG is delivered to inventory, as shown in the STANDARD FG row and TOTAL ACT.QTY column. This corresponds to the credit value of 50,880.14- in the DELIVERY row and TOTAL ACTUAL column. The credit value is based on the standard cost estimate, which contains the costs for making 1,100 assemblies, because assembly scrap is planned.

Because total actual debits of 50,880.13 are nearly equal to total actual credits of 50,880.14, variance is nearly eliminated, as shown by the 0.01- in the summary (last) row of the TOTAL TGT column.

Total variance ideally should only include unplanned production costs. If you don't plan scrap, all scrap costs will post as a scrap variance, as demonstrated earlier in Figure 5.10. When you plan assembly scrap based on production statistics, scrap costs are separated from variance, and only the difference between plan and actual scrap costs posts as a variance, as shown in Figure 5.12.

Now that we've examined assembly scrap, let's look at the next type of scrap: component scrap.

5.3 Component Scrap

Component scrap includes the cost of faulty or lost components in the cost of sales. A case scenario involving component scrap was presented in Section 5.1. If component scrap is not planned, all component scrap costs post as a variance. Although variance can be included at a higher level in profitability reporting, planned component scrap is included at the material or gross profit level as discussed in Chapter 3. This results in more accurate analysis of profitability at the product level.

5.3.1 Component Scrap Definition

Component scrap can be defined as the percentage of component quantity that does not meet required production quality standards before being inserted in the production process. Planned component scrap is treated as additional consumption of the relevant component. Planned component scrap also improves the MRP process by ensuring that you start with an increased component quantity in order to achieve the required product yield. Component scrap is an *input* scrap because it is detected before use in the production process.

5.3.2 Effect of Component Scrap on Quantities

Scrap quantities are important because they cause scrap values. Let's follow a simple example of how component scrap applied at the component level affects component quantities. We'll also examine the interaction between component and assembly scrap.

Example

When planning to produce 100 finished PCBs, assembly scrap is calculated first, and component scrap is calculated second. Assembly scrap applied to the finished PCBs increases all component and activity quantities by 10%, as shown in the outlined QUANTITY COSTED column in Figure 5.13.

	Quantity no scrap	Quantity costed	Assembly scrap	Component scrap
Finished PCBs	100 PC	100 PC	0 PC	0 PC
Blank PCBs	100 PC	110 PC	10 PC	0 PC
BIOS	100 PC	110 PC	10 PC	0 PC
Operation 1	100 h	110 h	10 h	-
Processor	100 PC	116 PC	10 PC	6 PC
Operation 2	100 h	110 h	10 h	-

Figure 5.13 Component Scrap Increases Component Quantities

A component scrap of 5% applied to the Processor component increases the QUANTITY COSTED from 110 to 116, as shown in the outlined PROCESSOR row in Figure 5.13. Because component scrap is applied after assembly scrap, the COMPONENT SCRAP quantity is 6 PC.

Assembly and component scrap increase the plan cost of producing finished PCBs by increasing the plan quantity of components and activities. MRP will propose a production quantity of 110 assemblies, with the expectation that 100 will be delivered to inventory and 10 confirmed as scrap. MRP will also propose the consumption of a quantity of 116 PC of the Processor component, even though only 100 would be needed without planned scrap.

Now that we know what component scrap is and how it affects quantities, let's look at how to plan component scrap.

5.3.3 Component Scrap Master Data

You can plan component scrap in two different master data fields. The most commonly used field is located in the MRP 4 view of the material master, which you can access with Transaction MM02 or via menu path LOGISTICS • MATERIALS MANAGEMENT • MATERIAL MASTER • MATERIAL • CHANGE • IMMEDIATELY. Navigate to the MRP 4 tab to display the screen shown in Figure 5.14.

The screenshot shows the 'BOM explosion/dependent requirements' dialog box. It contains several fields and options:

Selection method	2	Component scrap (%)	10.00
Individual/coll.	2	Requirements group	
<input checked="" type="checkbox"/> Version Indicator		MRP dep.requirements	<input type="checkbox"/>

Figure 5.14 Component Scrap Field in the MRP 4 View of Component

Fill in the COMPONENT SCRAP (%) field with a flat rate percentage determined by your production statistics of scrap rates. You should update this field prior to each costing run if the statistics change during the current year. Later in Section 5.3, we'll examine how component scrap affects standard cost estimates.

Another field used to plan component scrap is located in the BASIC DATA tab of the BOM item. You can view or change BOM item details with Transaction CS02 or via menu path LOGISTICS • PRODUCTION • MASTER DATA • BILLS OF MATERIAL • BILL OF MATERIAL • MATERIAL BOM • CHANGE. Double-click on a BOM item to display the BOM item details, as shown in Figure 5.15.

The screenshot shows the SAP BOM Item Details form with the following fields and values:

BOM item	
Item Number	0290
Component	SP1000 Split Pin
Item category	L Stock item
Item ID	0000029
Sort string	
<input type="checkbox"/> Sub-item ID	
Quantity Data	
Quantity	2.000 EA
Operation scrap in %	<input type="checkbox"/> Net ID
Component scrap (%)	5.00

Figure 5.15 Component Scrap Field in BOM Item Details

An entry in the COMPONENT SCRAP (%) field in the BOM item takes priority over an entry in the material master, MRP 4 view. Fill in the COMPONENT SCRAP (%) field with a flat rate percentage determined by your production statistics of scrap rates.

Case Scenario

A component is used in many assemblies, and generally the component scrap rate is 10%, which is entered in the material master MRP 4 view of the component. One assembly is manufactured close to the inventory store, and only 5% of components are lost or damaged on the way to production of this assembly. A component scrap rate of 5% is entered in the component BOM item for this particular assembly. The component scrap rate of 5% in the BOM item takes priority over the 10% component scrap rate entered in the material master MRP 4 view of the assembly.

You should update this field prior to each costing run if the statistics change during the current year. We'll examine how component scrap affects standard cost estimates in the next section.

5.3.4 Planned Component Scrap Costs

Planned component scrap costs are included in the standard cost estimate. Let's compare two cost estimates, one *without* component scrap, and one *with* component scrap, to highlight the difference. To display the screen shown in Figure 5.16, use Transaction CK13N or menu path ACCOUNTING • CONTROLLING • PRODUCT COST CONTROLLING • PRODUCT COST PLANNING • MATERIAL COSTING • COST ESTIMATE WITH QUANTITY STRUCTURE.

Costing structure	E...	Total value	Scrap	Currency	Quantity	Scrap quantity	U...	Resource
STANDARD FG		46,254.68	0.00	USD	1,000.000	0.000	EA	1303 100010682
PRIMER		227.44	0.00	USD	7.000	0.000	GAL	1303 400000691
SFG		23,271.40	0.00	USD	1,000.000	0.000	EA	1303 300002252
URETHANE A 16		6,155.17	0.00	USD	6,034.483	0.000	LB	1303 400000693
MDI ISO B MATERIAL		1,525.52	0.00	USD	965.517	0.000	LB	1303 400000694

Figure 5.16 Cost Estimate without Component Scrap

The TOTAL VALUE of the STANDARD FG cost estimate *without* component scrap is 46,254.68. The figures in the SCRAP and SCRAP QUANTITY columns indicate that there is no planned output scrap. Now let's display a cost estimate for material STANDARD FG with 10% component scrap entered in the material master MRP 4 view, as shown in Figure 5.17.

Costing structure		Total value	Scrap	Currency	Quantity	Scrap quantity	U...	Resource
STANDARD FG		48,581.82	0.00	USD	1,000.000	0.000	EA	1303 100010682
PRIMER		227.44	0.00	USD	7.000	0.000	GAL	1303 400000691
SFG		25,598.54	0.00	USD	1,100.000	0.000	EA	1303 300002252
URETHANE A 16		6,155.17	0.00	USD	6,034.483	0.000	LB	1303 400000693
MDI ISO B MATERIAL		1,525.52	0.00	USD	965.517	0.000	LB	1303 400000694

Figure 5.17 Cost Estimate with Component Scrap

The TOTAL VALUE of the STANDARD FG cost estimate *with* component scrap is 48,581.82, which is higher than the TOTAL VALUE of 46,254.68 of the cost estimate *without* component scrap. This is because the quantity of component SFG has increased by 10%, as shown by comparing the QUANTITY columns in both cost estimates. The TOTAL VALUE of component SFG has increased by 10% due to the increase in QUANTITY.

The increase in component quantity is *not* shown in the SCRAP QUANTITY column. Component scrap is an *input quantity* variance, not an output scrap variance. Later in this section, we'll explore how to analyze component scrap in detail.

5.3.5 Actual Component Scrap Costs

Actual scrap costs usually occur during production order confirmation. This is when activities are confirmed and goods movements occur during backflushing and auto goods receipt, as discussed in detail in Chapter 3. Let's now create a production order and carry out a confirmation to demonstrate how actual component scrap costs occur.

You create a production order with Transaction CO01 or via menu path LOGISTICS • PRODUCTION • SHOP FLOOR CONTROL • ORDER • CREATE • WITH MATERIAL. To display the component overview screen shown in Figure 5.18, from the initial production order header screen, select GOTO • OVERVIEWS • COMPONENTS from the menu bar.

lte	Component	Description	Reqmts qty	U...	IC	Op...	Seq	Plnt	SLoc
0010	400000691	PRIMER	7.000	GAL	L	0010	0	1303	1
0030	300002252	SFG	1,100.000	EA	L	0010	0	1303	1
0040	000002016	15-42 URETHANE MIX	7,000.000	EA	M	0010	0	1303	1
0010	400000693	URETHANE A 16	6,034.483	LB	L	0010	0	1303	1
0020	400000694	MDI ISO B MATERIAL	965.517	LB	L	0010	0	1303	1

Figure 5.18 Production Order Component Quantities Increased by Planned Component Scrap

Component SFG quantity is automatically increased by 10% due to component scrap in the material master MRP 4 view, as we discussed earlier in Section 5.3. MRP proposes a total quantity of 1,100.000, as shown in the REQMTS QTY (requirements quantity) column in the SFG row, even though only 1,000 are required according to the BOM quantities. This is because it is expected that 100 of the components will be lost or damaged on the way to the production line or will not pass inspection for some reason.

Actual component scrap is posted during production order confirmation. In Chapter 3, we looked at a confirmation per operation. In this example, we'll look at a confirmation at the order header level with Transaction CO15, or via menu path LOGISTICS • PRODUCTION • SHOP FLOOR CONTROL • CONFIRMATION • ENTER • FOR ORDER. The screen shown in Figure 5.19 is displayed.

Goods movements

Order: 10048521 Status: REL MACM PCC

Material no.: 100010682 STANDARD FG

Partial conf.
 Final conf.
 Aut.fin.confirm
 Clear open reservs.

Actual data

	Current confirm.	Un.	Already confirmed	Total to confirm	Un.
Yield to conf.	1,000.000	EA	0.000	1,000.000	EA
Confirmed scrap			0.000	0.000	
Rework			0.000		
Reason					

Figure 5.19 Confirmation Screen with Component Scrap Planned

Only *output* scrap, such as assembly or operation scrap, is entered in the CONFIRMED SCRAP field. There is no expected output scrap to confirm, as shown at the TOTAL TO CONFIRM column of the CONFIRMED SCRAP row. Click on the GOODS MOVEMENTS button to display the goods movements screen shown in Figure 5.20.

Batch determination

Order: 10048540 Status: REL MACM P

Material no.: 100010682 STANDARD FG

Material	Quantity	E...	Plant	Sto...	Batch
100010682	1,000.000	EA	1303	1	
400000691	7.000	GAL	1303	1	
300002252	1,100.000	EA	1303	1	
400000693	6,034.483	LB	1303	1	
400000694	965.517	LB	1303	1	

Figure 5.20 Confirmation Goods Movements Screen

A QUANTITY of 1,100.000 for MATERIAL 300002252 (SFG) defaults from the production order. The production order quantity of component SFG was increased 10% due to component scrap entered in the material master MRP 4 view. If you manually adjust the default component quantity shown in Figure 5.20, you will introduce an unplanned input quantity variance.

After scrap is confirmed, you carry out variance calculation, as discussed in the next section.

5.3.6 Variance Calculation

Variance calculation is done using Transactions KKS6 (individual) and KKS5 (collective) or via menu path ACCOUNTING • CONTROLLING • PRODUCT COST CONTROLLING • COST OBJECT CONTROLLING • PRODUCT COST BY PERIOD • PERIOD-END CLOSING • SINGLE FUNCTIONS: PRODUCT COST COLLECTOR • VARIANCES. The screen shown in Figure 5.21 is displayed following variance calculation. You carry out variance analysis for production and process orders with Transactions KKS2 (individual) and KKS1 (collective).

Target cst	Σ Act. costs	Σ Ctrl costs	Σ Variance	Σ Scrap	Σ Rem. var.	Input qty var.	Actual qty
46,254.68	48,581.82	48,581.82	2,327.14	0.00	0.00	2,327.14	1,000.000
46,254.68	■ 48,581.82	■ 48,581.82	■ 2,327.14	■ 0.00	■ 0.00		

Figure 5.21 Component Scrap Displays as Input Quantity Variance

There is no scrap variance because component scrap is categorized as an input quantity variance, as shown by the 2,327.14 value in the INPUT QTY VAR. (input quantity variance) column. Detailed variance analysis for component scrap occurs in product cost collector reports, as explained in the next section.

5.3.7 Component Scrap Target/Actual

During a period or at period end, you may need to carry out further detailed analysis of scrap variance. Before doing so, you should first run variance calculation to update the target costs. You can display and analyze plan versus actual costs in detailed product cost collector reports with Transaction PKBC_PKO or via menu path ACCOUNTING • CONTROLLING • PRODUCT COST CONTROLLING • COST OBJECT CONTROLLING • PRODUCT COST BY PERIOD • INFORMATION SYSTEM • REPORTS FOR PRODUCT COST BY PERIOD • DETAILED REPORTS. A similar report is available for production and process orders with Transaction PKBC_ORD.

Let's compare three detailed reports to demonstrate how component scrap affects variance.

Component Scrap Not Planned and Actual Scrap Posted

The first product cost collector report contains an unfavorable scrap variance because component scrap is not planned while actual scrap is posted, as shown in Figure 5.22.

Transact.	Origin	Origin (Text)	Σ Total tgt	Σ Ttl actual	Σ Variance	Σ Scrap	Σ Qty variance	Total act.qty
Confirmations	1303B-5420/LABOR	Production / Labor Hours	4,578.48	4,578.48	0.00	0.00	0.00	232.292
	1303B-5420/OVHD	Production / Overhead Hours	6,027.98	6,027.98	0.00	0.00	0.00	232.292
	1303B-5420/MNT	Production / Maintenance Hours	3,349.65	3,349.65	0.00	0.00	0.00	232.292
	1303B-5420/ELEC	Production / Electricity	770.99	770.99	0.00	0.00	0.00	5,317.191
	1303B-5420/NATGAS	Production / Natural Gas	348.05	348.05	0.00	0.00	0.00	870.137
Goods issues	1303/400000691	PRIMER	227.44	227.44	0.00	0.00	0.00	7.000
	1303/400000693	URETHANE A 16	6,155.17	6,155.17	0.00	0.00	0.00	6,034.483
	1303/400000694	MDI ISO B MATERIAL	1,525.52	1,525.52	0.00	0.00	0.00	965.517
	1303/300002252	SFG	23,271.40	25,598.54	2,327.14	0.00	2,327.14	1,100.000
Debit			46,254.68	48,581.82	2,327.14	0.00	2,327.14	
Goods receipt	1303/100010682	STANDARD FG	46,254.68-	46,254.68-	0.00	0.00	0.00	1,000.000-
Delivery			46,254.68-	46,254.68-	0.00	0.00	0.00	
			0.00	2,327.14	2,327.14	0.00	2,327.14	

Figure 5.22 Component Scrap Not Planned and Actual Scrap Posted

Because component scrap is not planned, actual component scrap posts as an unfavorable input quantity variance, with a value of 2,327.14 in the VARIANCE (total variance) and QTY VARIANCE (input quantity variance) columns.

A component quantity needed to make 1,100.000 STANDARD FG is issued from inventory, as shown in the TOTAL ACT.QTY column. This corresponds to the value of 25,598.54 in the SFG row and TTL ACTUAL (total actual costs) column.

Because the standard cost estimate doesn't contain planned component scrap, the component target value of 23,271.40 in the SFG row in the TOTAL TGT (total target costs) column is 10% less than the component actual value of 25,598.54. This results in an unfavorable variance of 2,327.14, as shown in the DEBIT row of the QTY VARIANCE column.

Overall, because total actual debits of 48,581.82 are greater than total actual credits of 46,254.68, the result is an unfavorable variance of 2,327.14 in the summary (last) row of the TOTAL ACTUAL column.

Now that we've looked at how posting component scrap without planning for it results in an unfavorable variance, let's see the effect of planning but not posting component scrap.

Component Scrap Planned and Actual Scrap Not Posted

Compare the report in the previous section with an *unfavorable* variance to a report in this section with a *favorable* variance, which results from planning component scrap but not posting an actual increase in component quantity, as shown in Figure 5.23.

Transact.	Origin	Origin (Text)	Σ Total tgt	Σ Ttl actual	Σ Variance	Σ Scrap	Σ Qty variance	Total act.qty
Confirmations	1303B-5420/LABOR	Production / Labor Hours	4,578.48	4,578.48	0.00	0.00	0.00	232.292
	1303B-5420/OVHD	Production / Overhead Hours	6,027.98	6,027.98	0.00	0.00	0.00	232.292
	1303B-5420/MNT	Production / Maintenance Hours	3,349.65	3,349.65	0.00	0.00	0.00	232.292
	1303B-5420/ELEC	Production / Electricity	770.99	770.99	0.00	0.00	0.00	5,317.191
	1303B-5420/NATGAS	Production / Natural Gas	348.05	348.05	0.00	0.00	0.00	870.137
Goods issues	1303/400000691	PRIMER	227.44	227.44	0.00	0.00	0.00	7.000
	1303/400000693	URETHANE A 16	6,155.17	6,155.17	0.00	0.00	0.00	6,034.483
	1303/400000694	MDI ISO B MATERIAL	1,525.52	1,525.52	0.00	0.00	0.00	965.517
	1303/300002252	SFG	25,598.54	23,271.40	2,327.14-	0.00	2,327.14-	1,000.000
Debit			■ 48,581.82	■ 46,254.68	■ 2,327.14-	■ 0.00	■ 2,327.14-	
Goods receipt	1303/100010682	STANDARD FG	48,581.82-	48,581.82-	0.00	0.00	0.00	1,000.000-
Delivery			■ 48,581.82-	■ 48,581.82-	■ 0.00	■ 0.00	■ 0.00	
			■ ■ 0.00	■ ■ 2,327.14-	■ ■ 2,327.14-	■ ■ 0.00	■ ■ 2,327.14-	

Figure 5.23 Component Scrap Planned and Actual Scrap Not Posted

Because component scrap is planned, all planned scrap that's not actually posted results in a favorable variance with a value of 2,327.14- in the QTY VARIANCE (input quantity variance) column.

A component quantity needed to make 1,000.000 STANDARD FG is issued from inventory, as shown in the TOTAL ACT.QTY column, and there is no increase in component quantity. This corresponds to the component actual value of 23,271.40 in the SFG row and TTL ACTUAL (total actual costs) column. This results in total actual debits of 46,254.68, as shown in the DEBIT row and the TTL ACTUAL column.

Because the standard cost estimate contains 10% planned component scrap, the component target value of 25,598.54 in the SFG row in the TOTAL TGT (total target costs) column is 10% greater than the component actual value of 23,271.40. This results in a favorable variance of 2,327.14-, as shown in the DEBIT row and QTY VARIANCE column.

Overall, because total actual debits of 46,254.68 are less than total actual total credits of 48,581.82, the result is a favorable variance of 2,327.14- in the summary row of the TOTAL ACTUAL column.

Now that we've looked at how posting component scrap without planning for it results in an unfavorable variance, and how planning component scrap and not actually posting it results in a favorable variance, let's see the effect of both planning and posting component scrap.

Component Scrap Planned and Actual Scrap Posted

Compare the reports in the previous two sections with unfavorable and favorable variances to the report in this section with no variance, since component scrap is planned and actual component quantity is posted, as shown in Figure 5.24.

Transact.	Origin	Origin (Text)	Σ	Total tgt	Σ	Ttl actual	Σ	Variance	Σ	Scrap	Σ	Qty var.	Total act.qty
Confirmations	1303B-5420/LABOR	Production / Labor Hours		4,578.48		4,578.48		0.00		0.00		0.00	232.292
	1303B-5420/OVHD	Production / Overhead Hours		6,027.98		6,027.98		0.00		0.00		0.00	232.292
	1303B-5420/MNT	Production / Maintenance Hours		3,349.65		3,349.65		0.00		0.00		0.00	232.292
	1303B-5420/ELEC	Production / Electricity		770.99		770.99		0.00		0.00		0.00	5,317.191
	1303B-5420/NATGAS	Production / Natural Gas		348.05		348.05		0.00		0.00		0.00	870.137
Goods issues	1303/400000691	PRIMER		227.44		227.44		0.00		0.00		0.00	7.000
	1303/400000693	URETHANE A 16		6,155.17		6,155.17		0.00		0.00		0.00	6,034.483
	1303/400000694	MDI ISO B MATERIAL		1,525.52		1,525.52		0.00		0.00		0.00	965.517
	1303/300002252	SFG		25,598.54		25,598.54		0.00		0.00		0.00	1,100.000
Debit				48,581.82		48,581.82		0.00		0.00		0.00	
Goods receipt	1303/100010682	STANDARD FG		48,581.82-		48,581.82-		0.00		0.00		0.00	1,000.000-
Delivery				48,581.82-		48,581.82-		0.00		0.00		0.00	
				0.00		0.00		0.00		0.00		0.00	

Figure 5.24 Component Scrap Planned and Actual Scrap Posted

Because component scrap is planned, and actual component quantities are posted as planned, no variances remain in the VARIANCE or QTY VAR. columns.

A component quantity needed to make 1,100.000 of STANDARD FG is issued from inventory, as shown in the TOTAL ACT.QTY column of the SFG row. This corresponds to the value of 25,598.54 in the TTL ACTUAL (total actual costs) column of the SFG row.

Because the standard cost estimate contains 10% planned component scrap, the component target value of 25,598.54 in the SFG row in the TOTAL TGT (total target costs) column is the same as the component actual value of 25,598.54. This results in a value of 0.00 in the QTY VARIANCE column of the DEBIT row.

Overall, because total actual debits of 48,581.82 are equal to total actual credits of 48,581.82, the result is a value of 0.00 in the summary row of the TTL ACTUAL column.

Total variance ideally should only include unplanned production costs. If you don't plan scrap, all scrap costs will post as a variance, as demonstrated in Figure 5.22. When you plan component scrap based on production statistics, scrap costs are included in the cost estimate, and only the difference between plan and actual component scrap costs posts as an input quantity variance, as demonstrated in Figure 5.24.

Now that we've examined assembly and component scrap, let's look at the third type of scrap: operation scrap.

5.4 Operation Scrap

Planned operation scrap includes the entire cost of faulty or lost assemblies in the cost of sales. If operation scrap is not planned, all scrap costs post as a variance. Although variances can be included at a higher level in profitability reporting, planned operation scrap is included at the material or gross profit level, as we discussed in Chapter 3. This results in more accurate analysis of profitability at the product level.

5.4.1 Operation Scrap Definition

Operation scrap can be defined as the percentage of assembly quantity that does not meet required production quality standards. For example, planned operation scrap of 20% means that if you start an operation with 125 pieces, you will lose 20% (25 pieces) during the operation. One hundred pieces will be available for the subsequent operation. Operation scrap is an output scrap because it reduces the planned output quantity in the production process.

Operation scrap has different effects on quantities, depending on whether it is entered in the routing, BOM item, or both. We'll now discuss the three possible options in the following subsections.

Operation Scrap in Routing

Operation scrap entered in the *routing* ensures that faulty assemblies are discarded before valuable components are inserted. The *output* quantity of assembly operations is reduced by the operation scrap amount before valuable components are inserted in a subsequent operation. This reduces wastage of valuable components discarded in assemblies.

Case Scenario

A music CD packaging facility inspects a CD case for scratches in operation 010 and inserts a CD in the case in operation 020. Operation scrap of 20% is applied at operation 010. For every 100 CD cases inspected, 20 are discarded, and CDs are inserted in 80 CD cases in operation 020. Because CDs are more expensive than cases, damaged cases are discarded before inserting the CDs.

However, the manufacturer still has a requirement to assemble 100 CDs in cases. Planned assembly scrap of 25% is added to the assembly material master. MRP generates a requirement for inspection of 125 cases in operation 010, and 20%, or 25 cases, are discarded due to operation scrap. One hundred cases are available for operation 020.

Now that we've discussed operation scrap entered in routings, let's see how operation scrap entered in BOM items works.

Operation Scrap in BOM Item

Operation scrap entered in the *BOM item* ensures the input quantity of valuable components inserted in an assembly is reduced. Assembly scrap entered in the material master of the assembly can be ignored by selecting a net checkbox. This allows close control over the planning and use of individual valuable components in an assembly. This may also be useful when a component can be salvaged and reused, even if the assembly does not pass quality inspection. If BOM operation scrap is not entered, assembly scrap from the material master is used.

Operation Scrap in Operation and BOM Item

Operation scrap entered in *both* the routing and BOM item reduces the *output* quantity of an assembly before valuable components are inserted in the next operation. It also controls the *input* quantity of individual valuable components in the assembly.

Routing operation scrap refers to the *activity* quantity used, while BOM operation scrap refers to the *material* quantity used.

5.4.2 Effect of Operation Scrap on Quantities

Scrap quantities are important because they cause scrap values. Let's follow a simple example of how operation scrap applied at the operation level affects component and activity quantities.

You begin a process with 100 finished PCBs. If planned operation scrap of 10% is entered in the first operation, and 20% is entered in the second operation in the routing of the finished PCB, a quantity of 72 finished PCBs will be available at the end of the second operation, as shown in Figure 5.25.

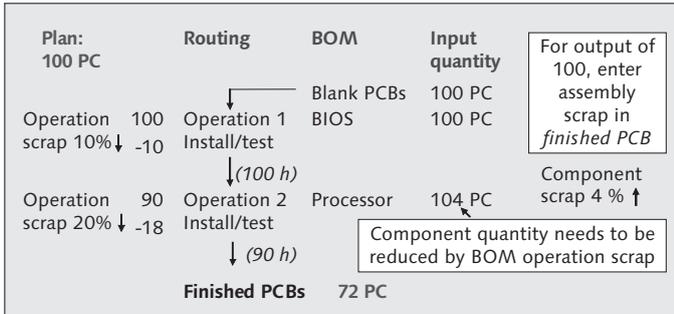


Figure 5.25 Operation Scrap Reduces Operation Output

By decreasing operation output quantity, operation scrap increases the cost of producing the finished PCBs. MRP will propose a production quantity of 100 assemblies, with the expectation that 72 PC will be delivered to inventory, and 28 partial assemblies will be confirmed as scrap. No operation scrap is entered in the BOM item in this example.

Now that we know what operation scrap is and how it affects scrap quantities, we'll investigate how to plan operation scrap.

5.4.3 Operation Scrap Master Data

You can plan operation scrap in two master data fields. The most commonly used field is located in the routing operation details view. To enter operation scrap, as displayed in Figure 5.26, use Transaction CA02 or menu path LOGISTICS • PRODUCTION • MASTER DATA • ROUTINGS • ROUTINGS • STANDARD ROUTINGS.

General data	
Scrap in %	10.000
No. of time tickets	
No. confirm. slips	
Wage group	
Wage type	
Suitability	
Number of employees	
Setup type key	
Setup group category	
Setup group key	
CostingRelevncy	<input checked="" type="checkbox"/>
<input type="checkbox"/> Non-value-added	

Figure 5.26 Operation Scrap Field in Operation Details

You enter operation scrap in the SCRAP IN % field of the GENERAL DATA section of the routing operation details screen.

Another field used to plan operation scrap is located in the BASIC DATA tab of the BOM item. You can view or change BOM item details with Transaction CS02 or via menu path LOGISTICS • PRODUCTION • MASTER DATA • BILLS OF MATERIAL • BILL OF MATERIAL • MATERIAL BOM • CHANGE. Double-click on a BOM item to display BOM item details, as shown in Figure 5.27.

The screenshot shows the SAP BOM item details screen with the 'Basic Data' tab selected. The 'BOM item' section contains the following fields: Item Number (0290), Component (SP1000), Item category (L Stock item), Item ID (00000029), and Sort string. The 'Quantity Data' section contains the following fields: Quantity (2.000), Operation scrap in % (5.00), and a checked 'Net ID' checkbox. There are also tabs for 'Status/Lng Text', 'Administr.', and 'Document' at the top.

Figure 5.27 Operation Scrap Field in BOM Item

You enter operation scrap in the OPERATION SCRAP IN % field of the BASIC DATA tab of the BOM item. The NET ID checkbox is selected to ignore assembly scrap, and it must be selected if you enter operation scrap. For a particular component, operation scrap allows you to enter a different scrap percentage, usually less than the assembly scrap percentage.

5.4.4 Planned Operation Scrap Costs

Planned operation scrap costs are included in the standard cost estimate. Let's compare two cost estimates, one *without* operation scrap, and one *with* operation scrap, to highlight the difference. To display the screen shown in Figure 5.28, use Transaction CK13N or menu path ACCOUNTING • CONTROLLING • PRODUCT COST CONTROLLING • PRODUCT COST PLANNING • MATERIAL COSTING • COST ESTIMATE WITH QUANTITY STRUCTURE.

Costing structure	E...	Total value	Scrap	Currency	Quantity	Scrap quantity	U...	Resource
STANDARD FG		46,254.68	0.00	USD	1,000.000	0.000	EA	1303 100010682
PRIMER		227.44	0.00	USD	7.000	0.000	GAL	1303 400000691
SFG		23,271.40	0.00	USD	1,000.000	0.000	EA	1303 300002252
URETHANE A 16		6,155.17	0.00	USD	6,034.483	0.000	LB	1303 400000693
MDI ISO B MATERIAL		1,525.52	0.00	USD	965.517	0.000	LB	1303 400000694

Figure 5.28 Cost Estimate without Operation Scrap

The TOTAL VALUE of the STANDARD FG cost estimate *without* operation scrap is 46,254.68. The figures in the SCRAP and SCRAP QUANTITY columns indicate there is no planned output scrap. Now let's display a cost estimate for material STANDARD FG with 10% operation scrap entered in the first operation of the routing, as shown in Figure 5.29.

Costing structure		Total value	Scrap	Currency	Quantity	Scrap quantity	U...	Resource
STANDARD FG		46,254.68	0.00	USD	900.000	0.000	EA	1303 100010682
PRIMER		227.44	22.74	USD	7.000	0.700	GAL	1303 400000691
SFG		23,271.40	2,327.14	USD	1,000.000	100.000	EA	1303 300002252
URETHANE A 16		6,155.17	615.52	USD	6,034.483	603.448	LB	1303 400000693
MDI ISO B MATERIAL		1,525.52	152.55	USD	965.517	96.552	LB	1303 400000694

Figure 5.29 Cost Estimate with Operation Scrap

The TOTAL VALUE of the STANDARD FG cost estimate *with* operation scrap is 46,254.68, the same as *without* operation scrap. However, the output QUANTITY of the cost estimate *with* operation scrap is reduced by 10%, from 1,000.000 *without* operation scrap, to 900.000 *with* operation scrap. It costs the same to produce 900.000 with operation scrap as it does to produce 1,000.000 without operation scrap, so per unit cost is increased by operation scrap.

Tip

To quickly determine if operation scrap is included in a cost estimate, click on the cost estimate QTY STRUCT. (quantity structure) tab, which displays the screen shown in Figure 5.30.

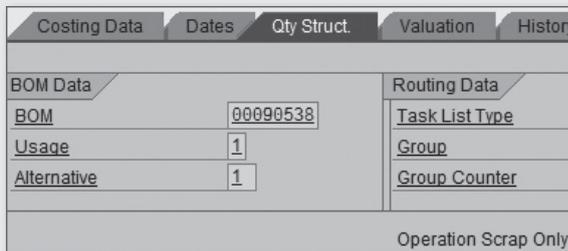


Figure 5.30 Operation Scrap Only Text in Cost Estimate

The OPERATION SCRAP ONLY text indicates that operation scrap is included in the cost estimate, without the need to refer to operation details. Information text also appears in the same tab if assembly scrap is included in the cost estimate as discussed in Section 5.2.

Now that we've looked at planning for operation scrap with master data entries and how it affects cost estimates, let's examine how actual operation scrap postings occur.

5.4.5 Actual Operation Scrap Costs

Actual scrap costs usually occur during production order confirmation. That is when operation output is either confirmed as yield or as scrap. We'll now create a production order and carry out a confirmation to demonstrate how actual operation scrap costs occur.

You create a production order with Transaction CO01 or via menu path LOGISTICS • PRODUCTION • SHOP FLOOR CONTROL • ORDER • CREATE • WITH MATERIAL. From the production order header screen, select GOTO • OVERVIEWS • OPERATIONS from the menu bar to display the operations overview screen. Then double-click on the operation in which you entered operation scrap in Section 5.4 to display the production order operation detail screen shown in Figure 5.31.

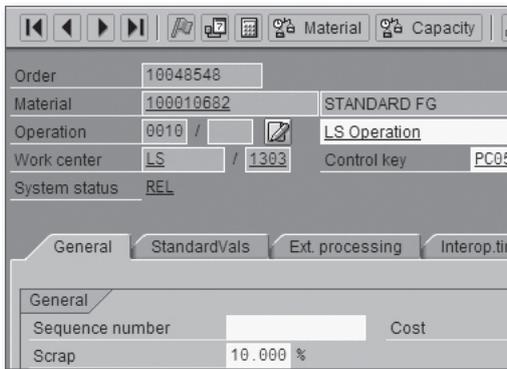


Figure 5.31 Production Order Operation Scrap Field

Operation SCRAP defaults from the routing, as discussed in Section 5.4. Production order total quantity is unchanged by planned operation scrap. MRP proposes

a quantity of 1,000, with plan yield of 900 and an operation scrap quantity of 100.

Actual operation scrap is posted during production order confirmation. A confirmed scrap field is available, and planned operation scrap defaults from the production order when using confirmation Transaction CO11N or menu path LOGISTICS • PRODUCTION • SHOP FLOOR CONTROL • CONFIRMATION • ENTER • FOR OPERATION • TIME TICKET, as shown in Figure 5.32.

Enter time ticket for production order					
Confirmation		125821			
Order	10048612	Material	100010682	STANDARD FG	
Oper./activity	0010	Sequence	0	Operation	
Confirm.type		1 Automatic final confirm...		<input checked="" type="checkbox"/> Clear open reservations	
Yield / Scrap					
	To confirm	Un.	Already confd	Planned total	Un.
Yield	900.000	EA	0.000	1,000.000	EA
Scrap	100.000		0.000	100.000	
Reason					

Figure 5.32 Production Order Confirmation Screen Includes Scrap Field

The PLANNED TOTAL YIELD quantity of 1,000.000 is reduced by default operation SCRAP quantity of 100.000, resulting in a default YIELD quantity of 900.000. If the default operation SCRAP quantity is manually changed, a scrap variance will result.

After scrap is confirmed, you carry out variance calculation, as discussed next.

5.4.6 Variance Calculation

Variance calculation is done using Transactions KKS6 (individual) and KKS5 (collective), or accessing menu path ACCOUNTING • CONTROLLING • PRODUCT COST CONTROLLING • COST OBJECT CONTROLLING • PRODUCT COST BY PERIOD • PERIOD-END CLOSING • SINGLE FUNCTIONS: PRODUCT COST COLLECTOR • VARIANCES. The screen shown in Figure 5.33 is displayed following variance analysis. You carry out variance analysis for production and process orders with Transactions KKS2 (individual) and KKS1 (collective).

Target cst	Σ	Act. costs	Σ	Ctrl costs	Σ	Variance	Σ	Scrap	Σ	Rem. var.	Actual qty
41,629.21		46,254.68		41,629.20		0.01-		4,625.48		0.00	900.000
41,629.21		46,254.68		41,629.20		0.01-		4,625.48		0.00	

Figure 5.33 Variance Calculation Output Screen

Operation scrap has reduced the expected ACTUAL QTY delivered to inventory to 900.000 from 1,000.000. Operation scrap doesn't increase the manufactured quantity, so after the planned operation scrap quantity is actually confirmed as scrap, the output quantity is less than the quantity required. You need to plan assembly scrap as well as operation scrap in order to output the required quantity, as described in the case scenario in Section 5.4.

The unfavorable SCRAP variance of 4,625.48 indicates that operation scrap was posted but not planned in this example. Scrap variance is subtracted from total variance, which simplifies the task of analyzing total variance.

Click on the SCRAP button (not shown) in the variance calculation output screen to display details of the scrap variance by cost element and operation.

Now that we've examined how to plan and post actual scrap and calculate variance, let's look at how to report and analyze operation scrap postings.

5.4.7 Operation Scrap Target/Actual

During a period or at period end, you may need to do further detailed analysis of scrap variance. Before analysis during a period, you should first run variance calculation to update the target costs. You can display and analyze target versus actual costs in detailed product cost collector reports with Transaction PKBC_PKO or via menu path ACCOUNTING • CONTROLLING • PRODUCT COST CONTROLLING • COST OBJECT CONTROLLING • PRODUCT COST BY PERIOD • INFORMATION SYSTEM • REPORTS FOR PRODUCT COST BY PERIOD • DETAILED REPORTS. A similar report is available for production and process orders with Transaction PKBC_ORD.

Let's compare a series of three detailed reports to demonstrate how operation scrap affects variance.

Operation Scrap Not Planned and Actual Scrap Posted

The first report contains an unfavorable scrap variance, which results from not planning operation scrap, while posting actual scrap, as shown in Figure 5.34.

Transact.	Origin	Origin (Text)	Σ Total tgt	Σ Ttl actual	Σ Variance	Σ Scrap	Total act.qty
Confirmations	1303B-5420/LABOR	Production / Labor Hours	4,120.63	4,578.48	457.85	457.85	232.292
	1303B-5420/OVHD	Production / Overhead Hours	5,425.18	6,027.98	602.80	602.80	232.292
	1303B-5420/MNT	Production / Maintenance Hours	3,014.68	3,349.65	334.97	334.97	232.292
	1303B-5420/ELEC	Production / Electricity	693.89	770.99	77.10	77.10	5,317.191
	1303B-5420/NATGAS	Production / Natural Gas	313.25	348.05	34.80	34.81	870.137
Goods issues	1303/400000691	PRIMER	204.70	227.44	22.74	22.74	7.000
	1303/400000693	URETHANE A 16	5,539.65	6,155.17	615.52	615.52	6,034.483
	1303/400000694	MDI ISO B MATERIAL	1,372.97	1,525.52	152.55	152.55	965.517
	1303/300002252	SFG	20,944.26	23,271.40	2,327.14	2,327.14	1,000.000
Debit			■ 41,629.21	■ 46,254.68	■ 4,625.47	■ 4,625.48	
Goods receipt	1303/100010682	STANDARD FG	41,629.21-	41,629.21-	0.00	0.00	900.000-
Delivery			■ 41,629.21-	■ 41,629.21-	■ 0.00	■ 0.00	
			■ ■ 0.00	■ ■ 4,625.47	■ ■ 4,625.47	■ ■ 4,625.48	

Figure 5.34 Operation Scrap Not Planned and Actual Scrap Posted

Because operation scrap is not planned, actual operation scrap posts as an unfavorable variance with a value of 4,625.48 in the SCRAP variance column.

Activity and component quantities needed to make 1,000.000 STANDARD FG are issued from inventory, as shown in the TOTAL ACT.QTY column. This corresponds to the value of 46,254.68 in the TTL ACTUAL (total actual costs) column of the DEBIT row.

A quantity of 900.000 STANDARD FG is delivered to inventory, as shown in the TOTAL ACT.QTY column. This corresponds to the credit value of 41,629.21- in the TTL ACTUAL column of the DELIVERY row.

Because total actual debits of 46,254.68 are greater than the total actual credits of 41,629.21, an unfavorable variance of 4,625.47 results, as shown in the summary row of the TOTAL ACTUAL column.

Now that we've looked at how posting operation scrap without planning for it results in an unfavorable variance, let's see the effect of planning but not posting operation scrap.

Operation Scrap Planned and Actual Scrap Not Posted

Compare the report in the previous section with an *unfavorable* scrap variance to a report in this section with a *favorable* scrap variance, which results from planning component scrap but not posting actual scrap, as shown in Figure 5.35.

Transact.	Origin	Origin (Text)	Σ Total tgt	Σ Ttl actual	Σ Variance	Σ Scrap	Total act.qty
Confirmations	1303B-5420/LABOR	Production / Labor Hours	4,578.48	4,120.63	457.85-	457.85-	209.063
	1303B-5420/OVHD	Production / Overhead Hours	6,027.98	5,425.18	602.80-	602.80-	209.063
	1303B-5420/MNT	Production / Maintenance Hours	3,349.65	3,014.69	334.96-	334.97-	209.063
	1303B-5420/ELEC	Production / Electricity	770.99	693.89	77.10-	77.10-	4,785.472
	1303B-5420/NATGAS	Production / Natural Gas	348.05	313.25	34.80-	34.80-	783.123
Goods issues	1303/400000691	PRIMER	227.44	204.70	22.74-	22.74-	6.300
	1303/400000693	URETHANE A 16	6,155.17	5,539.66	615.51-	615.52-	5,431.035
	1303/400000694	MDI ISO B MATERIAL	1,525.52	1,372.96	152.56-	152.55-	868.965
	1303/300002252	SFG	23,271.40	20,944.26	2,327.14-	2,327.14-	900.000
Debit			■ 46,254.68	■ 41,629.22	■ 4,625.46-	■ 4,625.47-	
Goods receipt	1303/100010682	STANDARD FG	46,254.68-	46,254.68-	0.00	0.00	900.000-
Delivery			■ 46,254.68-	■ 46,254.68-	■ 0.00	■ 0.00	
			■ 0.00	■ 4,625.46-	■ 4,625.46-	■ 4,625.47-	

Figure 5.35 Operation Scrap Planned and Actual Scrap Not Posted

Because operation scrap is planned, all planned scrap not actually posted results in a favorable scrap variance, with a value of 4,625.47- in the SCRAP column.

Activity and component quantities needed to make 900.000 STANDARD FG are issued from inventory, as shown in the TOTAL ACT.QTY column. This corresponds to the value of 41,629.22 in the TTL ACTUAL (total actual costs) column of the DEBIT row.

A quantity of 900.000 STANDARD FG is delivered to inventory, as shown in the TOTAL ACT.QTY column. This corresponds to the credit value of 46,254.68 in the TTL ACTUAL column of the DELIVERY row.

The credit value is based on the standard cost estimate, which contains the costs for making 1,000 assemblies because operation scrap is planned.

Because total actual debits of 41,629.22 are less than the total actual credits of 46,254.68, a favorable variance of 4,625.46- is shown in the summary row of the TTL ACTUAL column.

Now that we've looked at how posting operation scrap and not planning for it results in an unfavorable variance, and how planning operation scrap and not actually posting it results in a favorable variance, let's see the effect of both planning and posting operation scrap.

Assembly Scrap Planned and Actual Scrap Posted

Compare the reports in the previous two sections with favorable and unfavorable scrap variances to the report in this section with no scrap variance, which results from planning operation scrap and posting actual scrap, as shown in Figure 5.36.

Transact.	Origin	Origin (Text)	Σ Total tgt	Σ Ttl actual	Σ Variance	Σ Scrap	Total act qty
Confirmations	1303B-5420/LABOR	Production / Labor Hours	4,578.48	4,578.47	0.01-	0.00	232.292
	1303B-5420/OVHD	Production / Overhead Hours	6,027.98	6,027.97	0.01-	0.00	232.292
	1303B-5420/MNT	Production / Maintenance Hours	3,349.65	3,349.65	0.00	0.00	232.292
	1303B-5420/ELEC	Production / Electricity	770.99	770.99	0.00	0.00	5,317.191
	1303B-5420/NATGAS	Production / Natural Gas	348.05	348.06	0.01	0.00	870.137
Goods issues	1303/400000691	PRIMER	227.44	227.44	0.00	0.00	7.000
	1303/400000693	URETHANE A 16	6,155.17	6,155.18	0.01	0.00	6,034.483
	1303/400000694	MDI ISO B MATERIAL	1,525.52	1,525.51	0.01-	0.00	965.517
	1303/300002252	SFG	23,271.40	23,271.40	0.00	0.00	1,000.000
Debit			46,254.68	46,254.67	0.01-	0.00	
Goods receipt	1303/100010682	STANDARD FG	46,254.68-	46,254.68-	0.00	0.00	900.000-
Delivery			46,254.68-	46,254.68-	0.00	0.00	
			0.00	0.01-	0.01-	0.00	

Figure 5.36 Operation Scrap Planned and Actual Scrap Posted

Because operation scrap is planned and actual scrap is posted, scrap variance is eliminated, as shown in the summary row of the SCRAP variance column.

Activity and component quantities needed to make 1,000.000 STANDARD FG are issued from inventory, as shown in the TOTAL ACT.QTY column. This corresponds to the value of 46,254.67 in the TTL ACTUAL (total actual costs) column of the DEBIT row.

A quantity of 900.000 STANDARD FG is delivered to inventory, as shown in the TOTAL ACT.QTY column. This corresponds to the credit value of 46,254.68- in the TTL ACTUAL column of the DELIVERY row. The credit value is based on the standard cost estimate, which contains the costs for making 1,000 assemblies because operation scrap is planned.

Because the total actual debits of 46,254.67 are nearly equal to the total actual credits of 46,254.68, variance is nearly eliminated, as shown by the 0.01- in the summary row of the TTL ACTUAL column.

Ideally, total variance should only include unplanned production costs. If you don't plan scrap, all assembly and operations scrap costs will post as a scrap variance, as was demonstrated in Figure 5.34. When you plan operation scrap based on production

statistics, scrap costs are separated from variance, and only the difference between plan and actual scrap costs post as a variance, as demonstrated in Figure 5.36.

Now that we've carried out a detailed analysis of each of the three types of scrap, let's see an example with all three types of scrap combined.

5.5 Combined Scrap

In this section, we'll follow an example beginning with component scrap, and then progressively combine all three types of scrap in the following subsections.

5.5.1 Component Scrap

Component scrap increases input component quantity, as shown in Figure 5.37.

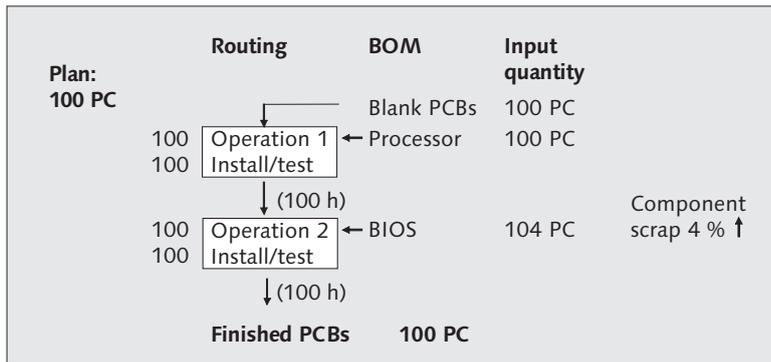


Figure 5.37 Component Scrap Increases Component Input Quantity

The BOM requires 100 blank PCBs, 100 processors, and 100 BIOS assemblies to manufacture 100 finished PCBs. The routing for the finished PCBs contains two operations that consume production activities. The blank PCBs and processors are assembled in operation 1, and the BIOS assemblies are added in operation 2.

To manufacture 100 PCBs, 104 BIOS assemblies are required. You can plan 4% component scrap in the BIOS assembly material master, BOM item, or both. The component scrap that you enter in the material master applies to all materials containing the BIOS assemblies as components. The component scrap that you

enter in the BOM item takes priority over the component scrap that is entered in the material master.

5.5.2 Component and Operation Scrap

Next we need to establish that an operation scrap of 10% occurs in operation 1, and 20% occurs in operation 2. You plan for operation scrap in the routing operation details, which reduces the activity quantity corresponding to the yield from the previous operation. Let's look at an example as shown in Figure 5.38.

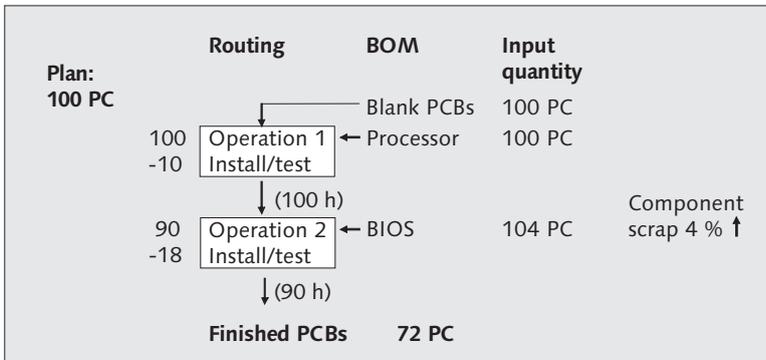


Figure 5.38 Operation Scrap Reduces Output Quantity

Output scrap reduces the operation output yield. In this example, the operation scrap of 10% reduces operation 1 output from 100 PC to 90 PC. The operation scrap of 20% reduces operation 2 output from 90 PC to 72 PC. You can plan routing operation scrap in the operation detail screen previously shown in Figure 5.26.

5.5.3 Component, Operation, and Assembly Scrap

Let's now look at a scenario involving the manufacture of 100 PC finished PCBs instead of 72 PC. You need to increase the input quantity of components and sub-assemblies to manufacture 100 finished PCBs. You achieve this by entering 38.89% assembly scrap in the finished PCB material master MRP 1 view.

Let's analyze how assembly scrap increases the quantity of finished PCBs in Figure 5.39.

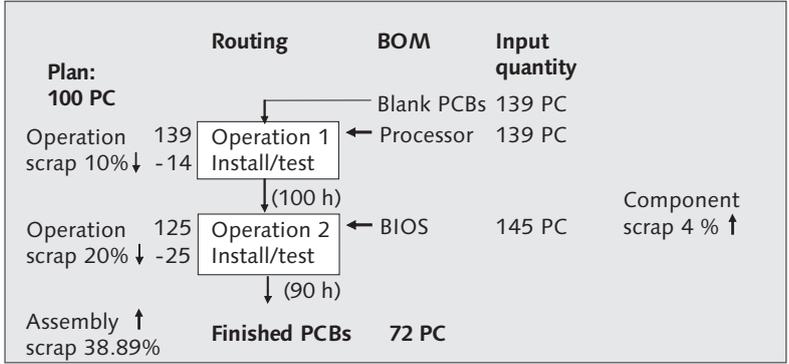


Figure 5.39 Assembly Scrap Corrects Output Quantity

Plan assembly scrap of 38.89% increases the output quantity of finished PCBs from 72 PC to 100 PC. Assembly scrap also increases the input quantity of components from 100 PC to 139 PC. Because 4% component scrap is also planned for the BIOS, the input quantity is increased from 104 PC to 145 PC. The BIOS quantity of 145 PC is calculated as follows:

1. Assembly Scrap

The planned assembly scrap of 38.89% entered in the finished PCB material master MRP 1 view increases the BIOS quantity from 100 PC to 139 PC.

2. Component Scrap

The planned component scrap of 4% entered in the BIOS material master MRP 4 view, or the BOM item details screen, increases the BIOS quantity from 139 PC to 145 PC.

Note

You can automatically calculate the assembly scrap required to compensate for a reduced production output due to operation scrap by scheduling the routing and transferring the assembly scrap into the material master, which we'll discuss later in Section 5.5.6.

We've corrected the output quantity of finished PCBs with plan assembly scrap. However, the input quantity of BIOS is 145 PC, while the required quantity is 125, which enters operation 2 from operation 1 as shown in Figure 5.39.

Let's now explore how to correct the component quantity with BOM item operation scrap.

5.5.4 BOM Item Operation Scrap

Operation scrap entered in the routing reduces the activity quantity, rather than the component quantity. You also need to enter operation scrap of 20% in the BOM item in order to ensure that the correct quantity of BIOS assemblies is removed from inventory. The resulting quantities are shown in Figure 5.40.

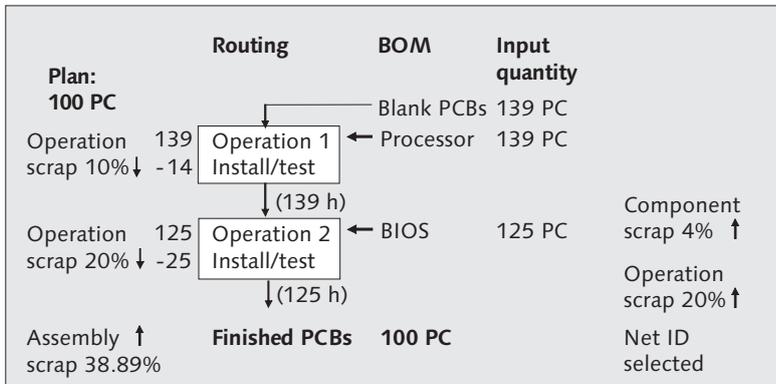


Figure 5.40 BOM Item Operation Scrap Corrects Component Quantity

BOM item operation scrap reduces the BIOS input quantity from 145 PC, shown in Figure 5.39, to 125 PC as shown in Figure 5.40. This number corresponds with the quantity of 125, which enters operation 2 from operation 1. You plan BOM item operation scrap as previously shown in Figure 5.27. The BIOS quantity of 125 PC shown in Figure 5.40 is calculated as follows:

1. Net ID Checkbox

When you plan BOM item operation scrap, you're required to select the NET ID checkbox, which ignores assembly scrap. At this stage, the component quantity is 100 PC.

2. Operation Scrap

Plan operation scrap entered in the BOM item increases the component quantity by 20%. At this stage, the component quantity is 120 PC.

3. Component Scrap

Plan component scrap entered in the BOM item increases the component quantity by 4%. At this stage, the component quantity is 125 PC.

By following these steps, we removed the assembly scrap of 38.89% from the BOM item, replaced it with operation scrap of 20%, and then increased the quantity by 4% component scrap.

5.5.5 Operation and Assembly Scrap

Let's now analyze our scenario without component scrap to help further illustrate how plan scrap affects quantities. Component plan scrap has been removed from the scenario shown in Figure 5.41.

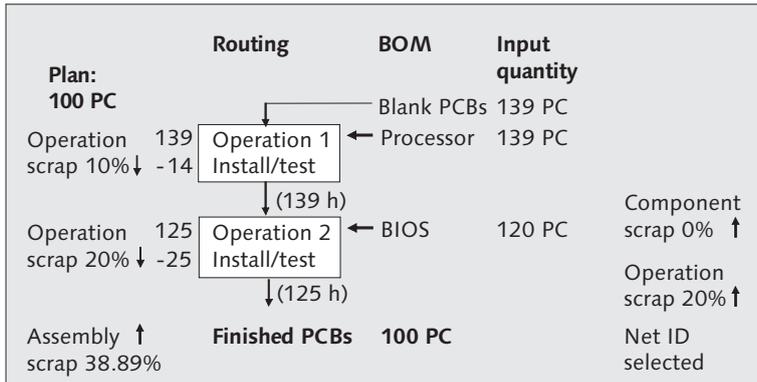


Figure 5.41 Operation and Assembly Scrap without Component Scrap

We have selected the NET ID checkbox, which ensures assembly scrap is ignored for the BIOS component. Operation scrap of 20% then increases the BIOS quantity from 100 PC to 120 PC.

Let's look at how you can automatically calculate the assembly scrap required to compensate for reduced production output due to operation scrap.

5.5.6 Calculate Assembly Scrap

Plan operation scrap records how many products will be lost or damaged in an operation. It reduces the output of an operation into subsequent operations. You

can enter plan assembly scrap in the material master MRP 1 view to achieve the required production output in combination with plan operation scrap.

If operation scrap occurs in many operations and in many assemblies, it can be time-consuming to manually calculate the required assembly scrap. You can automatically calculate assembly scrap and have the system populate the corresponding material master field.

Assembly Scrap Formula

Let's follow an example to illustrate how assembly scrap is calculated.

- ▶ Operation scrap reduces operation output quantity:
 - ▶ Input quantity 1,000 units
 - ▶ Operation 10 contains 20% operation scrap: Output quantity 800 units
 - ▶ Operation 20 contains 20% operation scrap: Output quantity 640 units
- ▶ Assembly scrap required to produce 1,000 assemblies:
 - ▶ Input quantity 1,562 units achieved with assembly scrap of 56.25%
 - ▶ Operation 10 contains 20% operation scrap: Output quantity 1,250 units
 - ▶ Operation 20 contains 20% operation scrap: Output quantity 1,000 units
- ▶ The system calculates assembly scrap with the following formula:

$$\text{Assembly scrap} = 1 / (1 - \text{operation scrap}) \times 1 / (1 - \text{operation scrap}) - 1$$

- ▶ You calculate assembly scrap in this example with the following values:

$$\begin{aligned} \text{Assembly scrap} &= 1 / (1 - 0.2) \times 1 / (1 - 0.2) - 1 \\ &= (1.25 \times 1.25) - 1 \\ &= 0.5625 \\ &= 56.25\% \end{aligned}$$

Now that we've examined the formula to calculate assembly scrap, let's see how you get the system to automatically calculate assembly scrap.

Assembly Scrap Calculation

You calculate assembly scrap automatically with Transaction CA97 or via menu path LOGISTICS • PRODUCTION • MASTER DATA • ROUTINGS • EXTRAS • MATERIAL

MASTER • SCHEDULE MATERIAL MASTER. The selection screen shown in Figure 5.42 is displayed.

Update Material Master: Initial Screen (for Mass Processing)

Material: P-100 to []

Plant: 1000

Prodn Supervisor: []

Task List Selection

Task List Type: []

Group: []

Group Counter: []

Plant: []

Planner group: []

Task list status: []

Usage: []

Key date: 02/13/2011

Selection date: []

Scheduling Results

Update material master directly

Update with assembly scrap

Figure 5.42 Transfer Scheduling Results to Material Master

This transaction allows you to transfer scheduling results from routings to material masters. You can transfer setup and teardown time, processing time, inter-operation time, assembly scrap, and base quantity. The transfer ensures consistency of scheduling data between routings and material masters, which is mandatory for requirements and detailed planning.

Select the **UPDATE WITH ASSEMBLY SCRAP** checkbox to update the **ASSEMBLY SCRAP** field in the material master MRP1 view with the automatically calculated assembly scrap.

Note

If scheduling does not calculate an assembly scrap value, then the material master assembly scrap value is overwritten with the value zero.

Type in your entries in the selection screen in Figure 5.42 and press to display the results screen shown in Figure 5.43.

Update Material Master: Results							
Error log							
Selected materials with scheduling results							
Scheduled materials:						1	
Scheduled materials with errors:						0	
Scheduled materials without errors:						1	
Material number	Plnt	Error	Setup	Process	MoveTime	Scrap	Base qty Uni
P-100	1000		0.07	15.48	4.66	0.00	100 PC
TL type: N Group:				50000002	Group counter:		1

Figure 5.43 Transfer Scheduling Results Output Screen

The results screen lists the material masters that were selected and displays the success of the update.

Now that we've discussed how to automatically calculate assembly scrap, we've reached the end of this chapter on scrap variance. Let's review what we covered.

5.6 Summary

In this chapter, we discussed scrap basics, including the difference between scrap and rework, and presented a case scenario involving the interaction between assembly and component scrap, and the decision of whether to scrap or rework. We also briefly looked at the definition of the three types of scrap: assembly scrap, component scrap, and operation scrap.

We then analyzed each of the three types of scrap at a detailed level and looked at diagrams to help you understand the effect of scrap on quantities and costs. We also looked at how to plan scrap by making master data entries, and we examined the priorities if two entries are made.

We analyzed the effect of plan scrap on cost estimates by analyzing cost estimates before and after the plan scrap entries. We also looked at a shortcut for determining if assembly and/or operation scrap influence a cost estimate: clicking on the cost estimate quantity structure tab.

We explained how actual scrap postings occur, by first creating a production order and then carrying out confirmations involving scrap. We then carried out variance calculation and analyzed the output results screen.

We then examined three detailed reports for each type of scrap:

- ▶ First, we analyzed the effect of not planning scrap and then posting actual scrap, and the resulting unfavorable variance.
- ▶ Second, we saw the effect of planning for scrap but not actually posting scrap, and the resulting favorable variance.
- ▶ Third, we examined the ideal scenario of planning for scrap and then posting the planned amounts of scrap. One of the main benefits of this scenario is the reduction in total variance, making it easier to analyze other variance categories, as described in Chapter 4.

Finally, we followed scenarios combining the three types of scrap, and then examined how to automatically calculate assembly scrap.

In Chapter 6, we'll walk through the many excellent standard reports available for CO reporting in general and for variance reporting in particular.

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