2024 Biennial Report
to Congress as Required by the Coin Modernization, Oversight, and Continuity Act of 2010
(Public Law 111-302)

United States Mint
Department of the Treasury

2024

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Executive Summary

As authorized by the *Coin Modernization, Oversight, and Continuity Act of 2010* (Act) [P.L. 111-302], the United States Mint (Mint) has continued in the last two years research and development (R&D) of alternative metals for modernizing coins and improving general production. The efforts are aimed at finding alternative coin compositions that will be less costly and yet still seamless[1] to the public, the coin-handling industry, and vending machine operations/usage. This 2024 report provides an update on the status of R&D of the alternative metals that the Mint is still considering as potential metallic compositions. This report also includes two improvements to production processes.

With regard to alternative metals, both in the Mint's 2022 Biennial Report and in this report, the Mint has identified one solution that could be ready to implement approximately one year after an authorization by Congress, as well as a few other compositions that future testing may determine to yield even more cost savings. As early as 2022, the Mint reported that it had completed testing the alternative metal, 80/20 cupronickel, and the 2022 Biennial Report stated that this alternative alloy is ready to be authorized by Congress for production. Once authorized, the Mint will conduct final validation and preparations to start full production for the 5-cent (nickel), 10-cent (dime), 25-cent (quarter dollar), and 50-cent (half dollar) coins. This alternative metal would be seamless and would improve revenue.

Additionally, the Mint continues researching two forms of C99750[2] that show promise as a seamless alternative metal for coining that would likely yield even better cost savings. That research is ongoing, and initial testing has shown promising results.

No additional research was conducted on the penny during the last two years. The Secretary of the Treasury has directed the Mint to suspend the production of the circulating one-cent coin (penny) indefinitely.

The body of the report and *Appendix 1: Additional Information on Alternative Metals Research Completed (2022-2024)* provides update on all the alternative metal compositions still being considered.

With regard to research production improvements, the Mint reports two improvements to be implemented: PVD coated work hubs and coin blank finishing optimization. Further details on these improvements are included in the body of this report and *Appendix 2: Additional Information on Engineering Assessments Regarding Production Improvements (2022-2024)*.

Finally, the biennial report is required to provide the status of coin production costs and cost trends for such production. Fiscal Year (FY) 2024 unit costs are higher than those reported in our 2022 Biennial Report due to inconsistent and diminished orders from the Federal Reserve Banks (FRB). In addition to rising metal costs, each denomination is

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[1] Seamless" means the alternative metal will result in no discernable difference to the general public and minimal adverse impact to other stakeholders like the coin handling equipment or vending industry.

[2] C99750 is an alternative metal alloy comprised of copper, nickel, zinc, and manganese.

absorbing additional fixed costs due to the diminished number of coins in production. The findings are in the body of the report and *Appendix 3: Additional Information on Production Cost of Circulating Coins*.

The Mint continues to support efforts that would allow the Mint to implement alternative metals when certain criteria are met. Legislation such as the proposed *Coin Metal Modification Authorization and Cost Savings Act* (H.R. 2817 and S. 1228 in the 118th Congress and H.R. 1278 in the 119th Congress) would grant the Mint authority to act on its R&D for seamless solutions when they offer cost savings and have minimal adverse impact on the public and stakeholders. It is important to note that if the *Coin Metal Modification Authorization and Cost Savings Act* were approved, once alternative metal compositions completed final production testing, switching from one metal composition to another would not require significant effort or cost. The Mint supports the Coin Metal Modification Authorization and Cost Savings Act (H.R. 1278 in 119th Congress).

Because of the recent reduction and inconsistency of coin orders by the Federal Reserve, timely action is recommended to permit the use of alternative metals. The cost of producing coins is directly impacted by the quantity of coins ordered. In 2024, there was more than a 50% drop in the quantity of coins ordered by the Federal Reserve. With fewer coins being produced, the overhead costs increase per coin. Cost-saving efforts in material costs are available, as noted within this report, to retain seigniorage and improve revenue for the General Fund, but the Mint is unable to take any action on them because of the restrictions under the current laws.

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Background

The Mint has three primary missions: mint and issue circulating coins; produce and distribute numismatic items; and provide security and asset protection. Since 1996, the Mint's operations have been funded through the Public Enterprise Fund (PEF) (31 U.S.C. § 5136). The operations of the Mint are divided into two major lines of business, or components: circulating coinage and numismatic products. Finances for circulating coinage and numismatic products are accounted for separately. Receipts from circulating coinage operations are not used to fund numismatic operations, and receipts from numismatic operations are not used to fund circulating coinage operations.

The Mint generates revenue through three channels: the issuance of circulating coins to the FRBs, the sale of numismatic products to the public, and the sale of bullion coins to authorized purchasers. The difference between the face value of circulating coins and the full cost of producing the coins is called seigniorage, which is transferred periodically to the Treasury General Fund to help finance the national debt. The Mint submits annual audited financial statements to the Secretary of the Treasury (Secretary) and to the Congress in support of the operations of the PEF.

The Coin Modernization, Oversight, and Continuity Act of 2010 (Act) [P.L. 111-302] authorizes the Secretary to conduct R&D on alternative metallic materials for all circulating coins with the goal of finding methods to reduce production costs. The Act also requires the Secretary to provide a biennial report to Congress on the status of coin production costs, cost trends for such production, and possible new metallic material or technologies for the production of circulating coinage.

The Mint submitted its first biennial report in December 2012. This 2024 Biennial Report is the seventh biennial report produced, as required by the Act. In each report, including this one, the Mint provides options for reducing costs, thereby improving revenue, through changing the metal composition of circulating coins, but to date, Congress has not authorized the Mint to take any action based on the Mint's recommendation.

Research and Development of Alternative Metals for Circulating Coins (2022-2024)

80/20

The final step for this alternative metal option would be production testing. The Mint would not move forward until Congressional authorization, due to costs associated with final testing. As a result, no additional work has been done on 80/20 since the 2022 report.

If Congress chooses to implement this alternative metal, the Mint will need approximately one year for final validation of large-scale production before starting production for general circulation in the following calendar year.

Based on production quantities and costs, this alternative metal could have generated $2.5 million in 2024 alone achievable with lower material cost. For more information, please see *Table 1: Revenue, Status, Benefits and Risks of Alternative Options* later in this section of the report and *Appendix 1: Additional Information on Alternative Metals Research Completed (2022-2024)*.

C99750TM Low Mn

Since 2022, coinage metal development efforts have focused on optimizing C99750TM as a possible seamless alternative to the 75/25 cupronickel currently in circulation. Initially, the C99750TM alloy had a golden hue and was judged to be unacceptable as an alternative to the current silver white hued 75/25 cupronickel. However, several rounds of color optimization trials were conducted with several C99750TM alloy variants to match 75/25 cupronickel for color, weight, wear/corrosion resistance, conductivity, and coinability.

Two C99750TM alloy variants were identified in the 2022 Biennial Report as acceptable alternatives to 75/25 cupronickel:

1. C99750TM Low Manganese alloy (C99750TM Low Mn)
2. C99750TM High Manganese alloy (C99750TM High Mn)

Both alloy variants match 75/25 cupronickel for color, weight, wear/corrosion resistance, conductivity, and coinability. Metal cost savings associated with C99750TM High Mn are forecasted to be significantly better than for C99750TM Low Mn. However, the higher manganese content coin may create a risk to coinage production due to the limited worldwide manganese supply and rising demand for this metal in the production of batteries for electric vehicles.

Because of this potential risk, during the last two years, the Mint has focused on testing of C99750TM Low Mn as an alternative metal for coins. Testing of C99750TM Low Mn is being conducted in two phases:

Phase One – Internal Mint Testing

Internal Mint tests have been completed, and results indicate that C99750TM Low Mn alloy is a seamless alternative to incumbent 75/25 cupronickel. Those tests included:

1. As-received Annealed Blank Hardness
2. Planchet Conductivity (after burnish and upset)
3. Planchet Color Measurement and Steam Testing
4. Tonnage Progression Strikes (Coinability)
5. Scan Coin 100-Cycle Wear Test
6. Coin Validator Acceptance Testing

Further information about each test can be found in *Appendix 1: Additional Information on Alternative Metal Research Completed (2022-2024)*.

Phase Two – External Coin Acceptor Manufacturer Testing

C99750TM Low Mn test pieces, along with circulating cupronickel circulating coins for baseline comparison, will be sent to at least three separate coin-acceptor manufacturers for validation testing. This phase is currently underway at the time of this report and will be completed for the 2026 Biennial Report.

Based on production quantities and costs, C99750TM (low manganese) could have improved seigniorage by an estimated $3.9 million in 2024, and C99750TM (high manganese) could improve seigniorage by an estimated $6.4 million. For more information, please see *Table 1: Revenue, Status, Benefits and Risks of Alternative Metal Options* on the next page.

Copper Plated Steel (CPS) Penny

In the 2022 Biennial Report, the Mint anticipated testing for optimization of Copper Plated Steel (CPS) pennies. Considering there is currently only one supplier of current penny planchets, there is a real risk to the supply chain for manufacturing this coin for circulation. Because of the risk to the supply chain, this alternative metal may be worth considering in the future as a co-production option and therefore worth continued research.

However, after the 2022 Biennial Report was issued, the Mint determined further testing would not be worthwhile at this time due to a lack of cost savings, and potential complications in manufacturing more than one composition of penny at the same time. As such, no additional testing was completed during the last two years. However, due to the decrease in demand for pennies, CPS could be worthwhile in a leaner production environment. Additional mass production analysis would be needed. Because the materials needed for the current Copper Plated Zinc (CPZ) pennies are only available through one supplier,[3] due to the supply chain risk, this alternative could still be a possible consideration. Please see *Table 1: Revenue, Status, Benefits, and Risks of Alternative Metal Options* for more information about this alternative metal.

[3] Current pennies are made from copper-plated zinc. Only one supplier in the global market provides the planchets for penny production.

Table 1: Revenue, Status, Benefits, and Risks of Alternative Metal Options[4]

Alternative Metal Option	Est. Savings Based on 2024[5]	Status	Benefits	Risks Production Levels
80/20	$2,500,000	• Completed large scale production test in 2015. • During 2020-2022, tested one supplier's additional samples to confirm improved bonding process and avoid corrugation of metal layers. • During 2022-2024, no additional efforts have been taken.	• All tests to date have shown this alternative is seamless. • This version of the alloy is not commercially available off the shelf, so it is more resistant to counterfeiting. • Existing suppliers can still be used without significant changes to their operations. • Compatible with Mint coin manufacturing operations.	• Testing to validate seamlessness was conducted in 2015. Once authorized, the Mint will conduct final validation testing to verify both cupronickel suppliers continue to maintain seamless expectations for coin processors and the vending industry during large-scale production.
C99750TM (Low Mn) (5¢, 10¢, 25¢, 50¢)	$3,900,000	• Received 5¢, 10¢, and 25¢ blanks for small scale testing in 2023. • With updated alloys, there is no longer a discernable color difference between this alternative metal and coins in circulation. • Completed internal Mint testing in 2024 of all denominations. • Seamless validation, to include Coin Acceptor Manufacturers (Scheduled completion – FY25). • Assuming testing is successful and further investigating is warranted, the next step will be first article trials at the Denver and Philadelphia Mints. This testing is anticipated to begin before the 2026 Biennial Report is submitted.	• Potentially seamless. • This version of the alloy is not commercially available off the shelf, so it is more resistant to counterfeiting. • Compatible with Mint coin manufacturing operations. • More metal cost savings than 80/20 cupronickel.	• Strip manufacturing issues may exist. To be determined. • Large scale testing is still needed with both cupronickel suppliers to verify that this alloy remains fully seamless for coin processors and the vending industry during large scale production.
C99750TM(High Mn) (5¢, 10¢, 25¢, 50¢)	$6,400,000	• With updated alloys, there is no longer a discernable color difference between this alternative metal and coins in circulation. • Based on the potential Manganese supply and demand risks from other industries, testing is on hold while further examination is occurring with the Low Mn alternative.	• Potentially seamless. • This version of the alloy is not commercially available off the shelf, so it is more resistant to counterfeiting. • Compatible with Mint coin manufacturing operations. • More metal cost savings than 80/20 cupronickel and C99750TM Low Mn.	• Strip manufacturing issues may exist. To be determined. • Large scale testing is still needed with both cupronickel suppliers to verify that this alloy remains fully seamless for coin processors and the vending industry during large scale production.
Copper Plated Steel (CPS) (1¢)	Potential for decreased revenue	• Small scale testing has been completed. • Large scale testing is on hold.	• Potentially seamless. • The current penny has only one supplier of planchets. This alternative opens use of multiple suppliers for a more robust and secure pipeline. • No adverse impacts to Mint penny manufacture. (No die coatings, no evidence of premature die failures, normal circulating stamping tonnage, etc.).	• Potential for greater costs than current copper plated zinc (CPZ). • CPS blank capacity insufficient to supply Mint forecasted penny demand. • Production scale stamping may uncover issues with die fatigue failures, die wear, CPS planchet incompatibility with existing stamping practices. To be determined if large scale testing occurs.

[4] Please see *Appendix 1: Additional Information on Alternative Metals Research Completed (2022-2024)* for more technically focused details.

[5] Estimated savings for FY24 have been significantly impacted by lower order rates. Please see Table 2.

Research and Development of Production Improvement for Circulating Coins (2022-2024)

Application of Physical Vapor Deposition (PVD) Coatings onto Work Hubs

Since 2010, the Mint has used PVD technology to coat numismatic coining dies, resulting in increased die life and improved numismatic coin quality in the Philadelphia, West Point, and San Francisco Mint facilities. Coining die manufacturing at the Mint is based on hubbing technology.

Hubbing is a cold-working process that involves using a hardened punch to stamp a cylindrical metal blank, called a work hub. Work hubs are then used to create the dies, which ultimately are used to create coins. Since 2010, the Mint has used PVD technology to coat numismatic coining dies with wear resistant coatings, resulting in significantly increased die life and improved coinage quality in the Philadelphia, West Point, and San Francisco Mints. During 2010, PVD coatings resulted in an overall die life increase of over 50%, resulting in the need to manufacture over 11,000 fewer numismatic dies at a savings of approximately $1M per year.

Currently, work hubs are not PVD coated. Unlike numismatic coining dies, where wear and fatigue were the main modes of failure, work hubs typically crack due to being subjected to high tonnages needed to form coining dies. In these cases, work hubs could be coated with low coefficient of friction (CoF) PVD coatings, which should lower the forming tonnage, increase fatigue hub life, and allow the Mint to hub more complex designs. The Mint manufactures fewer work hubs per year than work dies, so cost savings will not be as significant as that achieved when implemented for numismatic dies. The major manufacturing improvement will be the ability to hub more complex designs, possibly eliminating the need for more costly technology to achieve the same production goal.

A project is underway at the Denver Mint to install a turnkey cleaning line and PVD coating system for the first time to coat work hubs with low CoF Chromium Nitride coatings. This application has been successfully used at several foreign Mints, most notably at the Royal Canadian Mint. Several rounds of Mint test work hubs have been cleaned, PVD coated, returned, and successfully evaluated at the Mint. Forming trials results indicate the potential to achieve comparable design fill at less tonnage. Further onsite testing with production work hubs is necessary. The Denver Mint hub cleaning line and PVD coating system should become fully operational during the 2025 calendar year. Additional findings can be found in *Appendix 2: Additional Information on Engineering Assessments Regarding Production Improvements (2022-2024)*.

Coin Blank Finishing Optimization

To make coins, sheets of thin metal are cold rolled by coinage metal suppliers and shipped to the Mint in coil form. The coil is fed through a press that punches out coin blanks. Blanks are annealed in a rotary furnace to soften the metal and remove the residual stress. Despite the presence of a protective atmosphere in the furnace, an unwanted metal oxide layer forms on the surface of the blanks. The blanks are cooled in a quench tank and conveyed to a rotary barrel to be pickled to remove metal oxides. The oxide-free blanks are then washed, rinsed, and dried. Collectively, the processes after annealing are called coin blank finishing.

A project is underway to optimize both the annealing and finishing processes and at the same time reduce chemical/ water consumption at the Mint production facilities in both Philadelphia and Denver. This optimization will use a more protective annealing atmosphere within the rotary furnaces to reduce metal oxide formation. Annealing optimization will then be followed by an improved blank finishing process designed to consume less chemicals and water without compromising coin blank anti-tarnish and lubrication performance. Reduction in wastewater metal content will also be realized, especially during periods of peak production.

Preliminary optimization trials conducted during 2023 and 2024 suggest the potential to significantly reduce chemical consumption and wastewater metal content. Actual production improvements and cost reductions will be quantified after the Philadelphia and Denver Mints have implemented optimized blank annealing and finishing processes.

This optimization is scheduled for completion during the 2025 calendar year. Additional findings on the research can be found in *Appendix 2: Additional Information on Engineering Assessments Regarding Production Improvements (2022-2024)*.

Report of Production Cost of Circulating Coins (2022-2024)

The Act requires the biennial report to include the status of coin production costs and cost trends for such production. *Table 2: Unit Cost of Producing and Annual Volume Shipped to the Federal Reserve* and *Table 3: Unit Cost of Producing and Distributing Coins by Denomination* below provides an at-a-glance review of the costs over the last three fiscal years. FY 2024 unit costs are higher than those reported in our 2022 Biennial Report. This cost increase is primarily due to a significant decrease in FRB orders for new coins in FY 2024.

As shown in *Tables 2: Unit Cost of Producing and Annual Volume Shipped to the Federal Reserve* and *Table 3: Unit Cost of Producing and Distributing Coins by Denomination*, FY 2023 circulating cupronickel coin shipments to the FRB decreased by 0.36 billion units (5.4% drop) compared to FY 2022. FY 2024 circulating cupronickel coin shipments to the FRB decreased again, but this time by 3.71 billion units (58.3% drop) compared to FY 2023.

In addition to the impact on unit cost from lower orders, the costs of supplies and materials to produce the Nation's coins have increased significantly since FY 2020. The average price of copper, nickel, and zinc, which are the primary metals in each coin, have trended upward over time, resulting in an increase in the cost of metal for each denomination.

Table 2: Unit Cost of Producing and Annual Volume Shipped to the Federal Reserve

Five-Cent	Annual Volume *In Millions*	Per Unit Cost Est.	Compared to FY % Savings 2024	Estimated Savings Compared to FY 2024 *In Millions*
FY 2022 (Actual)	1,442	$0.1041	N/A	N/A
FY 2023 (Actual)	1,416	$0.1154	N/A	N/A
FY 2024 (Actual)	202	$0.1373	N/A	N/A
80/20 (CU/NI)	N/A	$0.1346	-2.1%	$0.6
C99750TM (Low MN Variant)	N/A	$0.1333	-3.1%	$0.8
C99750TM (High MN Variant)	N/A	$0.1305	-5.1%	$1.4
Ten-Cent	**Annual Volume *In Millions***	**Per Unit Cost Est.**	**Compared to FY % Savings 2024**	**Estimated Savings Compared to FY 2024 *In Millions***
FY 2022 (Actual)	2,849	$0.0503	N/A	N/A
FY 2023 (Actual)	2,665	$0.0530	N/A	N/A
FY 2024 (Actual)	840	$0.0576	N/A	N/A
80/20 (CU/NI)	N/A	$0.0572	-0.7%	$0.3
C99750TM (Low MN Variant)	N/A	$0.0570	-1.0%	$0.5
C99750TM (High MN Variant)	N/A	$0.0566	-1.7%	$0.8
Quarter-Dollar	**Annual Volume *In Millions***	**Per Unit Cost Est.**	**Compared to FY % Savings 2024**	**Estimated Savings Compared to FY 2024 In Millions**
FY 2022 (Actual)	2,426	$0.1109	N/A	N/A
FY 2023 (Actual)	2,274	$0.1163	N/A	N/A
FY 2024 (Actual)	1,605	$0.1467	N/A	N/A
80/20 (CU/NI)	N/A	$0.1458	-0.7%	$1.6
C99750TM (Low MN Variant)	N/A	$0.1452	-1.1%	$2.6
C99750TM (High MN Variant)	N/A	$0.1442	-1.8%	$4.2

Table 3: Unit Cost of Producing and Distributing Coins by Denomination for last Four Fiscal Years

2024	One-Cent	Five-Cent	Dime	Quarter-Dollar
Cost of Goods Sold	$0.0299	$0.1095	$0.0449	$0.1162
Selling, General & Administrative	$0.0066	$0.0266	$0.0121	$0.0293
Distribution to FRB	$0.0003	$0.0013	$0.0006	$0.0014
Total Unit cost	$0.0368	$0.1374	$0.0576	$0.1469
2023	**One-Cent**	**Five-Cent**	**Dime**	**Quarter-Dollar**
Cost of Goods Sold	$0.0273	$0.1002	$0.0463	$0.1004
Selling, General & Administrative	$0.0032	$0.0138	$0.0061	$0.0145
Distribution to FRB	$0.0003	$0.0013	$0.0006	$0.0014
Total Unit cost	$0.0308	$0.1154	$0.0529	$0.1163
2022	**One-Cent**	**Five-Cent**	**Dime**	**Quarter-Dollar**
Cost of Goods Sold	$0.0243	$0.0918	$0.0442	$0.0975
Selling, General & Administrative	$0.0026	$0.0109	$0.0054	$0.0118
Distribution to FRB	$0.0003	$0.0014	$0.0007	$0.0016
Total Unit cost	$0.0272	$0.1041	$0.0503	$0.1109
2021	**One-Cent**	**Five-Cent**	**Dime**	**Quarter-Dollar**
Cost of Goods Sold	$0.0181	$0.0743	$0.0386	$0.0843
Selling, General & Administrative	$0.0026	$0.0095	$0.0047	$0.0106
Distribution to FRB	$0.0003	$0.0013	$0.0006	$0.0014
Total Unit cost	$0.0210	$0.0851	$0.0439	$0.0963

Overall Findings and Recommendations

The Mint recommends that Congress pass a law to either specifically make changes to statutory coin composition or provide authority for the Mint to change to an alternative metal under certain conditions that will result in savings. The Mint specifically recommends granting authority to the Department of the Treasury, specifically the Mint, to act on alternative metal R&D for seamless solutions that reduce costs and have as minimal adverse impact as possible on the public and stakeholders. There is already legislation, introduced in several congresses including the 118th Congress, that would provide that type of authority (i.e., the *Coin Metal Modification Authorization and Cost Savings Act*). This legislative language was also included in the President's Budget Request for Fiscal Year 2025. The Mint continues to support *Coin Metal Modification Authorization and Cost Savings Act* (H.R. 1275 in 119th Congress).

Enacting this legislation would allow the Mint to act in real time on various alternative metals. Once an alternative metal is ready, and approved for production, switching between validated alternative metals is not a significant cost. As a result, approving this legislation would allow the Mint to pivot back and forth between validated metal compositions to save money based on the fluctuating costs of various metals. Having increased flexibility and authority also would improve the functionality of the Mint on multiple levels including:

- Allowing the Mint to proactively reduce risk of supply chain problems and improve overall continuity of operations.
- Making coin counterfeiting more difficult by selecting metals that are not commercially available.
- Reducing overall production costs.

As noted within this report, manufacturing costs are increasing, and coin orders are decreasing. With tighter margins, the ability to switch between validated alternative metals could make a significant difference for the Mint to maintain seigniorage.

At the least, the Mint recommends that Congress grant authority to the Department of the Treasury to produce coins with the 80/20 alternative metal for nickels, dimes, quarters, and half-dollar denominations. Based on 2024 production levels, use of the composition could have increased revenue by approximately $2.5 million this year, and it is the one alternative metal that has completed its full research. Once authorized, the Mint would need approximately one year for final supplier validation for large-scale production before starting production for general circulation in the next calendar year.

Appendix 1: Additional Information on Alternative Metals Research Completed (2022-2024)

Summary of Alternative Metals Research by the Mint over Years

Table 4: Summary of all Identified Potential Alternatives summarizes all identified potential alternatives evaluated by the Mint both during this period, as well as past research in prior biennial reports, including: whether these alloys are seamless or co-circulating, the denominations considered, and the testing status or readiness for implementation.

Table 4: Summary of All Identified Potential Alternatives

Alternative	Seamless/Co-Circulate	Denominations	Testing Status/Readiness for Implementation
80/20	Seamless	5¢, 10¢, and 25¢	Full First Article qualifications of Mint production and current supplier capability complete with external validation by three coin acceptor manufacturers (CAMs).
C99750TM	Potentially Seamless	5¢	Initially, C99750TM was no longer considered a valid alternative due to significant color differences when compared to incumbent cupronickel. However, additional testing and evaluations were conducted during this period to improve color. C99750TM (Low Mn) and C99750TM (High Mn) were identified as potentially acceptable variants.
Copper Plated Steel (CPS)	Seamless	1¢ only	Larger scale tests were completed during CY2022 to determine coining production impacts, determine economic potential, and define planchet specifications. No further testing or evaluation was conducted.
Multi-ply Plated Steel (MPPS)	Co-Circulate	25¢	Large pre-production scale testing completed--would need First Article qualification. No additional testing or evaluation this period.
Nickel Plated Steel (NPS)	Co-Circulate	25¢	Large pre-production scale testing completed--would need First Article qualification. No additional testing or evaluation this period.
Nickel Plated CPZ (Copper Plated Zinc)	Co-Circulate	5¢ and 25¢	Failed large-scale pre-production testing. This alternative was eliminated from further consideration.
R52 Stainless (monolithic)	Co-Circulate	5¢ only	Small scale feasibility testing completed with limited external CAM testing. No additional testing or evaluation this period.
Nickel Plated Silicon Steel	Co-Circulate	5¢ and 10¢	Small scale feasibility testing completed with limited external CAM testing. No additional testing or evaluation this period.

Please note that co-circulating alternatives (materials that were not expected to be seamless) were not evaluated during this period. Co-circulating materials offer greater material savings but would potentially require costly modifications to coin-accepting and handling equipment. Therefore, the focus of development efforts has been, and will continue to be, seamless alternative materials.

Seamless alternative materials are developed to work in current coin-accepting and handling equipment without modification. Listed below are more technical details about the seamless alternative materials that underwent evaluation during this period.

80/20 Cupronickel

No additional testing was conducted between 2022 and 2024. Please see the 2022 Biennial Report for the last testing information.

C99750TM

PHASE ONE TESTING (INTERNAL)

Internal Mint tests have been completed, and results indicate that C99750TM Low Mn alloy is a seamless alternative to incumbent 75/25 cupronickel. Those tests included:

1. As-received Annealed Blank Hardness
2. Planchet Conductivity (after burnish and upset)
3. Planchet Color Measurement and Steam Testing
4. Tonnage Progression Strikes (Coinability)
5. Scan Coin 100-Cycle Wear Test
6. Coin Validator Acceptance Testing

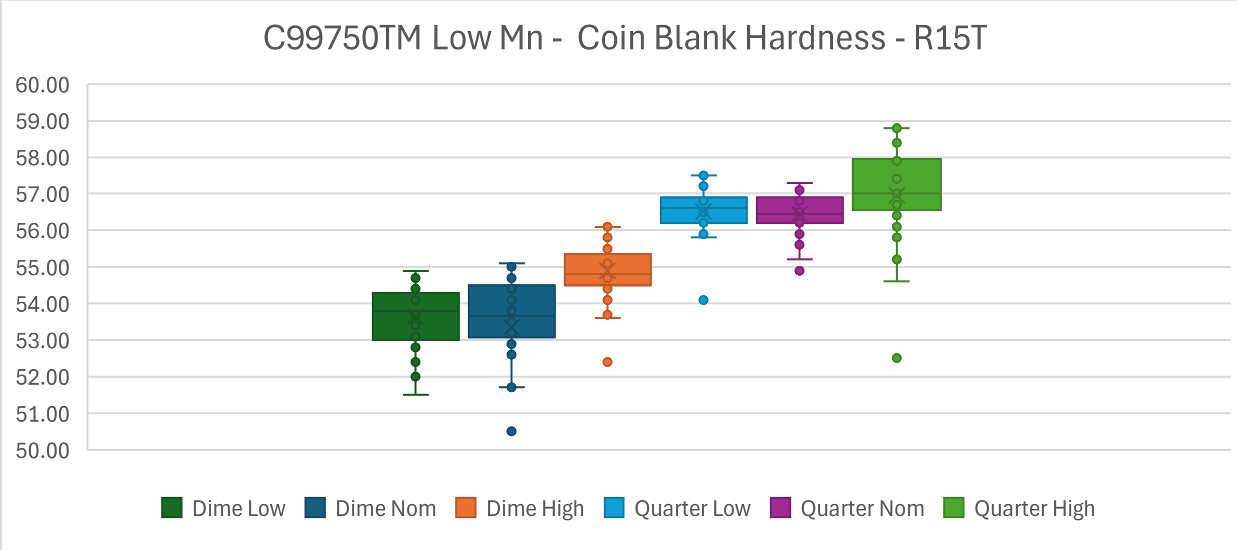
The details and results of these tests are explained in the next few pages.

Test 1: As-received Annealed Blank Hardness

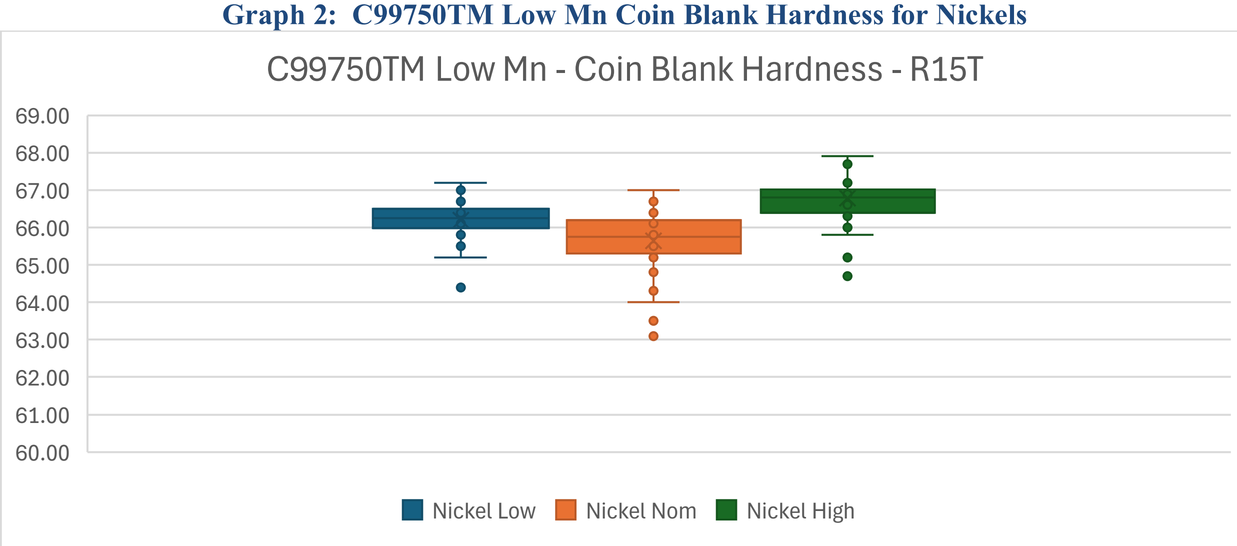
For the incoming hardness test, the Mint used a Wilson Model C523-T Hardness Tester set on the Rockwell 15T scale with appropriate penetrator to ensure that the alternative material's hardness was within the manufacturing range for the current material's hardness. For each denomination, the Mint chose 50 random, annealed blanks, sampled from all composition lots (low, nominal, and high compositions).

Graph 1: C99750TM Low MN Coin Blank Hardness for Dimes and Quarters and *Graph 2: C99750TM Low Mn Coin Blank Hardness for Nickels* shows the hardness of the C99750TM Low Mn material remained consistent across all composition levels for each denomination and was similar to the hardness of the current material; therefore, no issues with coin detail, die life, or coin durability are expected.

Graph 1: C99750TM Low Mn Coin Blank Hardness for Dimes and Quarters



Graph 2: C99750TM Low Mn Coin Blank Hardness for Nickels



Test 2: Planchet Conductivity

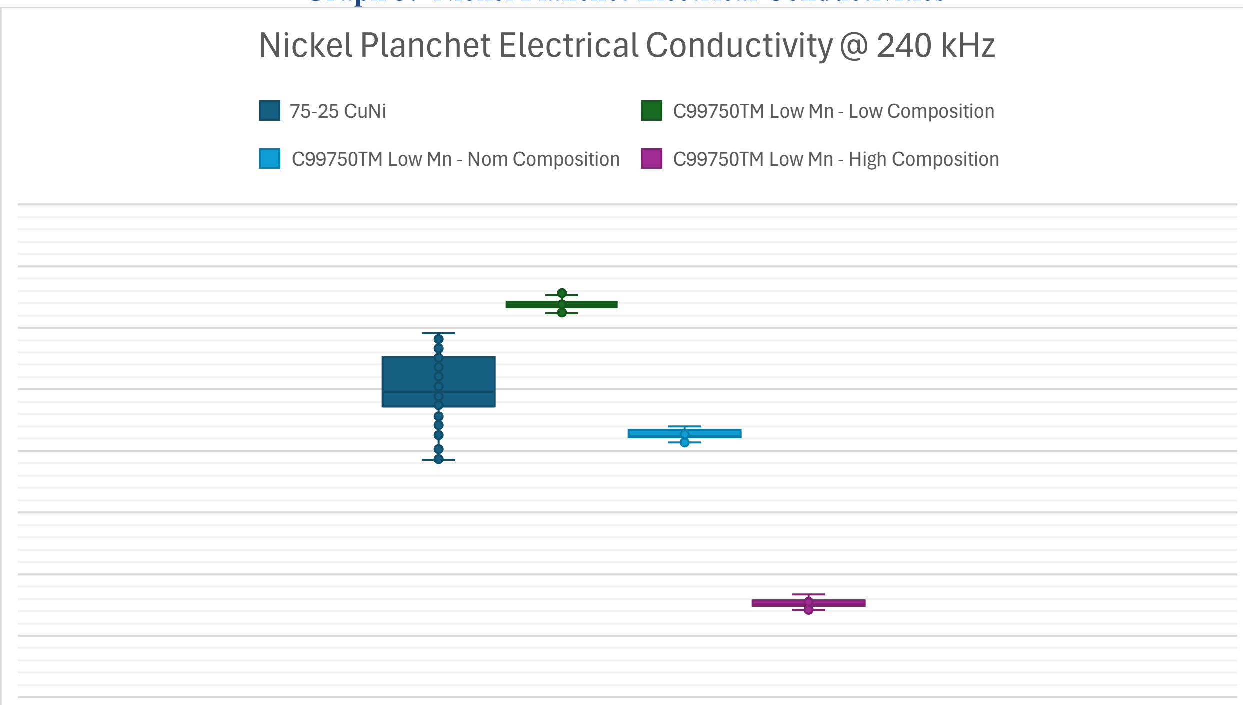
Conductivity is the ability of a material to pass an electrical current. When a material is melted, rolled, cut, upset, annealed, and struck, its conductivity can change at each step. The final conductivity of a struck coin, when tested at a certain frequency, yields the material's electromagnetic signature (EMS). EMS is the driver for acceptance in coin validators.

The electrical conductivity test used a Sigmatest conductivity meter to measure the material's electrical conductivity. This instrument can measure the electrical conductivity at frequencies of 60, 120, 480 and 960 kilohertz (kHz). Previous testing has shown that 240 kHz is an ideal frequency to detect blank defects such as poor bonding, incorrect cladding ratio and corrugation (excessive cladding waviness).

The graphs below show results of electrical conductivity performed at 240 kHz. However, conductivity tests were conducted at 60, 120, 480 and 960 kHz. The results were the same at all tested frequencies in that C99750TM Low Mn electromagnetic signature closely matched that of incumbent cupronickel.

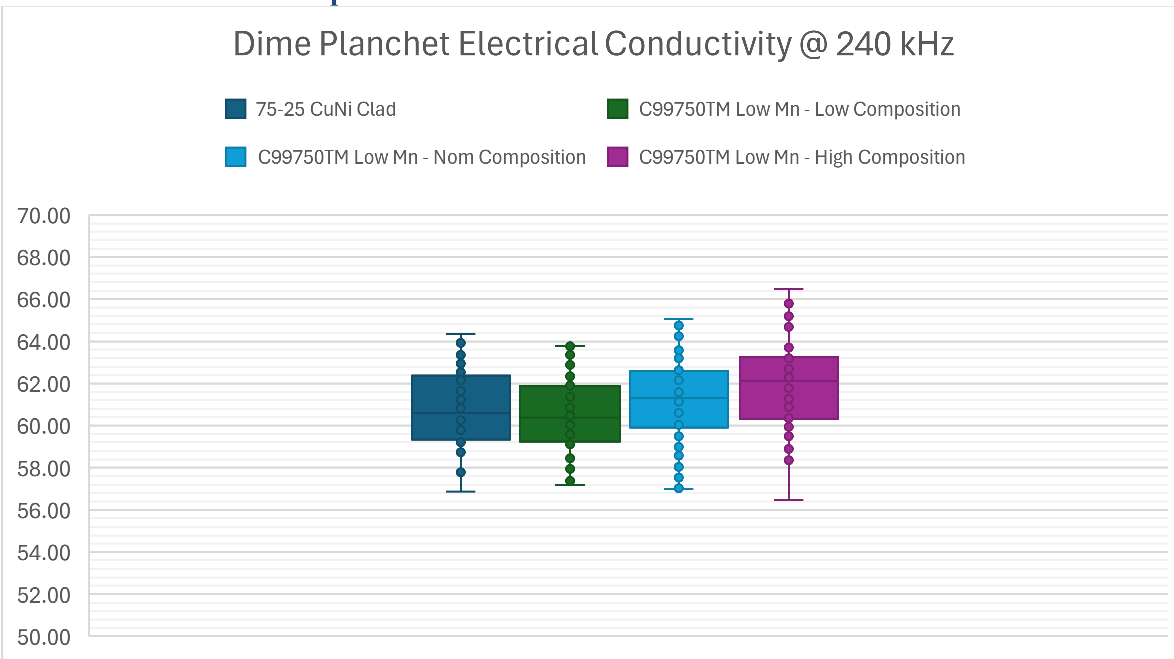
Graph 3: Nickel Planchet Electrical Conductivities shows that C99750TM Low Mn low, nominal, and high compositions are well within the desired conductivity window. Also, C99750TM Low Mn nominal composition is an acceptable match for current cupronickel.

Graph 3: Nickel Planchet Electrical Conductivities

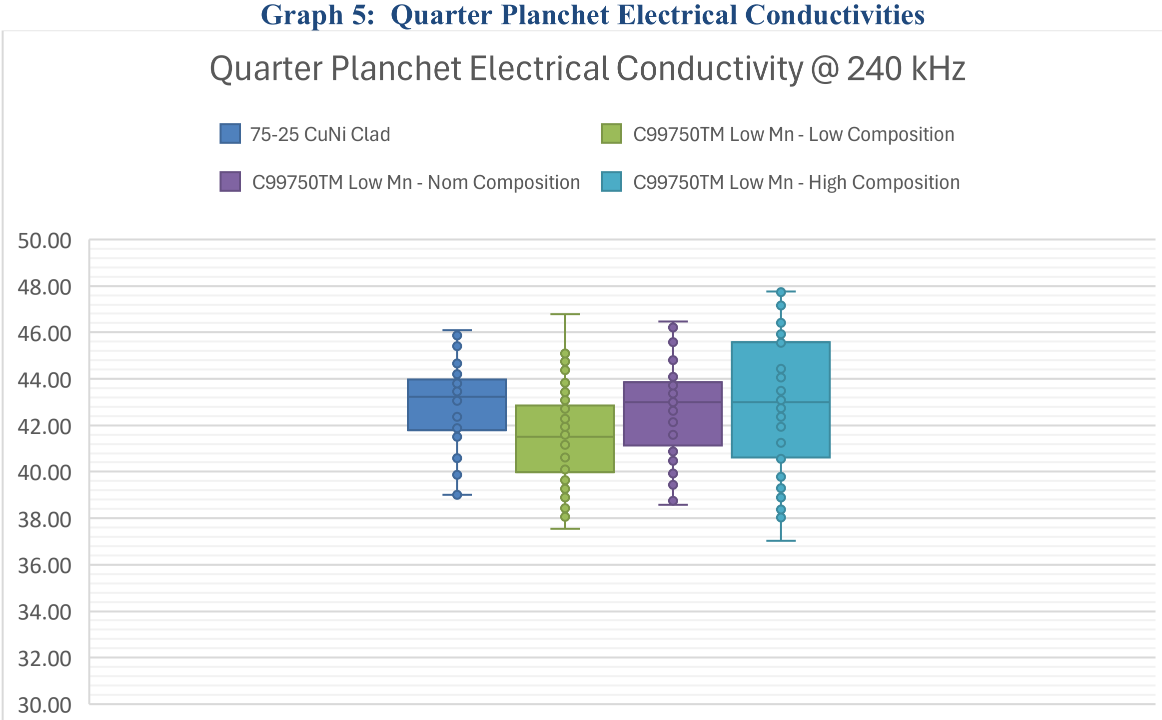


The electrical conductivities of C99750TM Low Mn clad for dime and quarter planchets are shown below in *Graph 4: Dime Planchet Electrical Conductivities* and on the next page in *Graph 5: Quarter Planchet Electrical Conductivities*. Electrical conductivities were also consistent across all composition levels for these denominations and matched the conductivities of the current cupronickel clad materials. Blank construction defects such as incorrect cladding ratio and corrugation were not detected. It is expected that the C99750TM Low Mn will be a seamless alternative to incumbent cupronickel. Technical validation of C99750 TM Low Mn as a seamless alternative will be confirmed by Coin Acceptor/Validators Manufacturers during the next phase of external testing. Coin acceptor manufacturers will use proprietary software, frequencies, and methods to determine if a material is seamless.

Graph 4: Dime Planchet Electrical Conductivities



Graph 5: Quarter Planchet Electrical Conductivities



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Test 3: Planchet Color Measurement and Steam Testing

The Mint took five sample planchets at random intervals for each material and measured the color (brightness and hue) with a spectrophotometer that gave a positive “L” value for the brightness, and then an “a” value (positive for red, negative for green) and a “b” value (positive for yellow, negative for blue) for the hue. This provides a quantitative color comparison of an alternative material to the current coinage material.

When those scores were recorded, the Mint steam tested the planchets in an autoclave for two hours at 100°C, atmospheric pressure, and 100 percent humidity to accelerate the oxidation rate compared with ambient conditions.

After steam testing, the Mint measured the color again and recorded the differences. This method was used to evaluate the properties of the anti-corrosion layer formed during the blank preparation process, whether this protective layer will adhere reliably to the planchet's surface and the alloy's inherent corrosion resistance. In the a and b color plan, less change meant a better corrosion resistance based on the alloy and protective chemical layer applied during blank washing after annealing.

The following images and graphs compare C713 (75/25 cupronickel) to the original C99750TM alloy developed and evaluated during Calendar Year (CY) 2019. The original C99750TM alloy exhibited a golden hue, which the Mint judged to be unacceptable for circulating coinage. Please see *Graphs 6: Comparison of C713 (75/25 Cupronickel) to Original C99750TM Alloy*, *Image 1: Comparison of C713 (75/25 Cupronickel) to Original C99750TM Alloy Washed Blanks After 2 Hour Steam Test*, and *Image 2: Strike Comparison of C713 (75/25 Cupronickel) and Original C99750TM* on the following pages.

The Mint requested the blank supplier conduct several iterations of optimization trials to develop C99750TM variants that closely match the C713 for color, be seamless in all critical attributes, and good potential for large scale manufacturability.

The C99750TM Low Manganese variant was shown to closely match the color of C713 both before and after steam testing. This alloy demonstrated good corrosion resistance and compatibility with existing blank finishing processes for circulating coinage.

Graph 6: Comparison of C713 (75/25 Cupronickel) to Original C99750TM

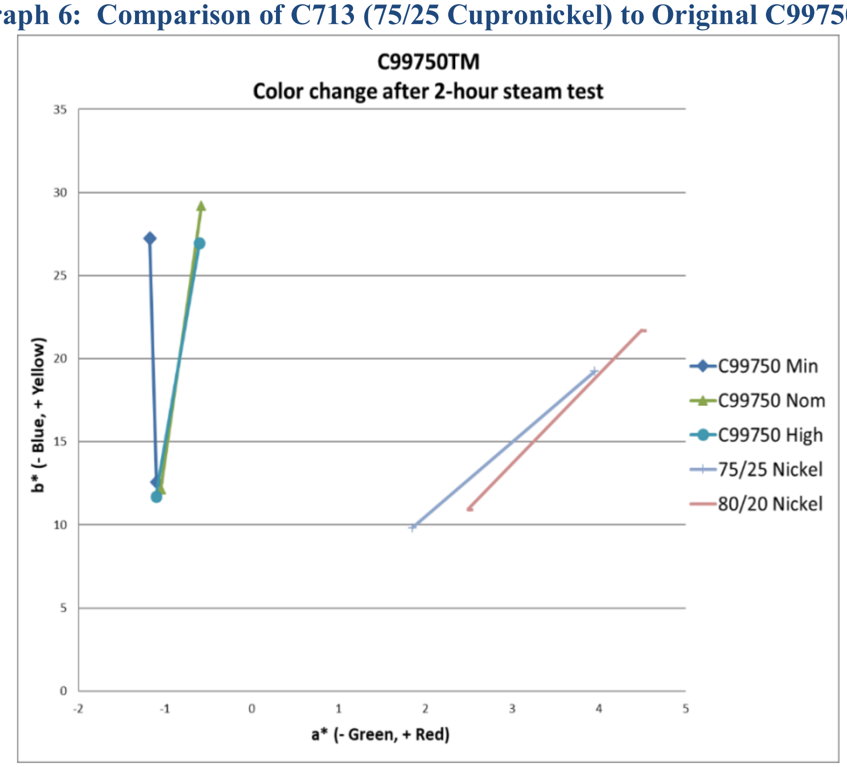


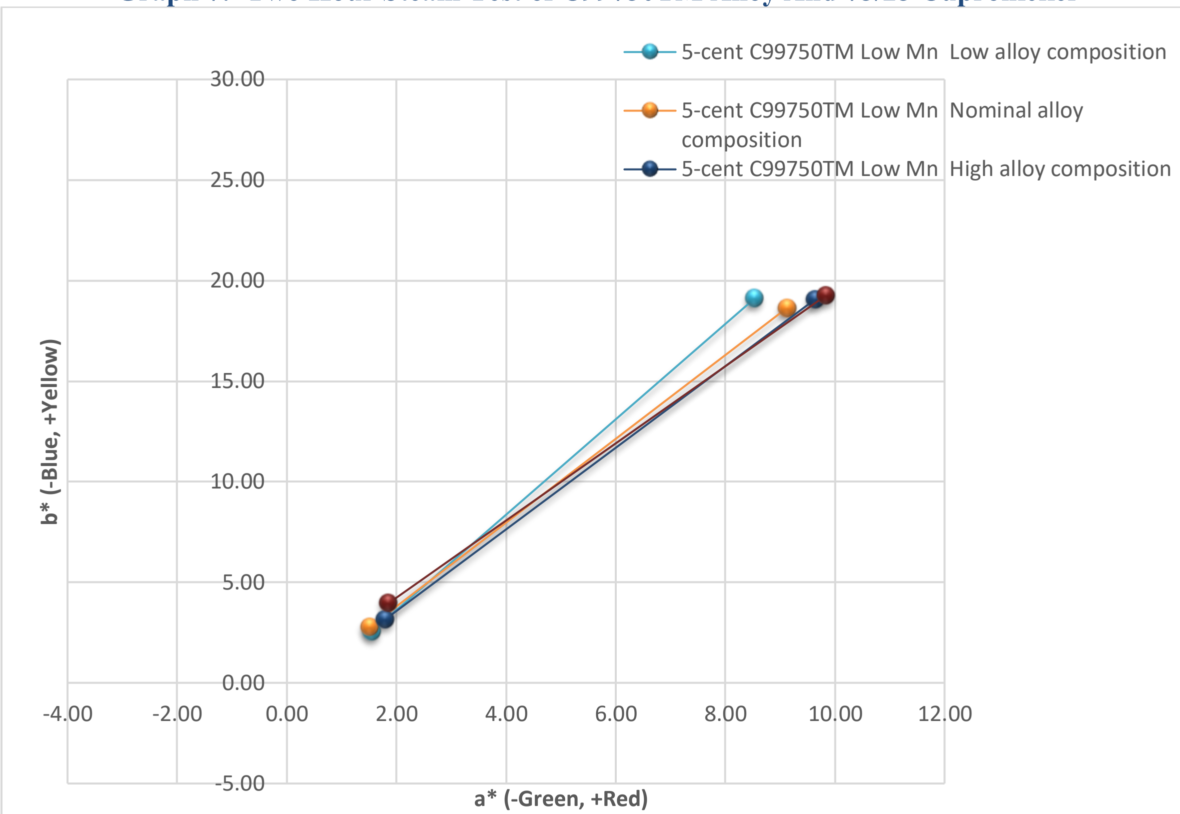
Image 1: Comparisons Of C713 (75/25 Cupronickel) To Original C99750TM Alloy: Washed blanks after 2-hour steam test

C713 **Original C99750TM**

Image 2: Strike Comparisons of C713 (75/25 cupronickel) and Original C99750TM

C713 **Original C99750TM**

Graph 7: Two Hour Steam Test of C99750TM Alloy And 75/25 Cupronickel



The color measurement points plotted on the lower left of the above *Graph 7: Two-Hour Steam Test of C99750TM Alloy and 75/25 Cupronickel* represent the following:

1. C713 (75/25)
2. C999750TM Low Mn (low alloy composition range)
3. C99750TM Low Mn (nominal alloy composition range)
4. C99750TM Low Mn (high alloy composition)

All of these color measurement points are virtually the same, meaning the starting color of C99750TM is virtually the same as that of C713, which was one of the C99750TM alloy optimization goals.

The color measurements of the original C99750TM, shown as the far-left coins, would have fallen in the far-left gradient of the graph.

After the two-hour steam test, tarnish resistances were determined by plotting ending color changes. Ending color changes were very similar for all four groups, implying very similar anti-tarnish and corrosion properties, C99750TM alloy optimization goals. This can be seen on the next page in *Image 3: Comparison of Nickel Strikes of Original C99750TM, C99750TM Low Mn, C99750TM High Mn, andC713 (75/25 Cupronickel) After Steam Test.*

Image 3: Comparison of Nickel Strikes of Original C99750TM, C99750TM Low Mn, C99750TM High Mn, andC713 (75/25 Cupronickel) After Steam Test

Original C99750TM **C99750TM Low MN** **C99750TM High MN** **C713 (75/25 Cupronickel)**

Test 4: Tonnage Progression Strikes (Coinability)

Coinability is a measure of how easy or difficult a material is to stamp into a coin. The various steps of coining can affect a coin in many ways, sometimes yielding an unacceptable effect, such as a rippling, wrinkling effect around the rim, cracking edges, or insufficient detail in the coin's face.

The Mint conducted a series of tonnage progressions strikes to ascertain the coinability of C99750TM Low Mn for each denomination. This test was started at a low tonnage and progressed incrementally through varying tonnages to the circulating striking tonnage and several tonnage settings over that. This typically involved striking at six tonnage settings and collecting at least five coins at each setting for a total of 30 coins for each lot of C99750TM blanks. In this manner, the ability of the material to "coin" can be assessed; degree of detail fill and dimensions (edge and diameter) are the criteria used to judge.

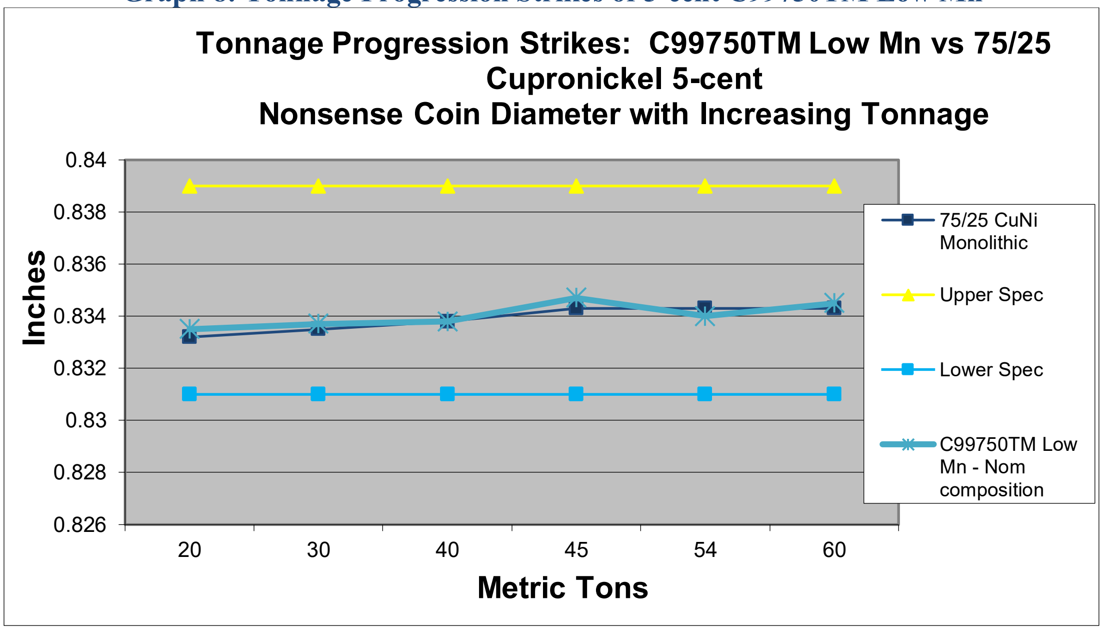
For each five-coin group, the Mint measured the test pieces with a micrometer accurate to one ten-thousandths of an inch for proper diameter, edge thickness, and design thickness (see graphs below).

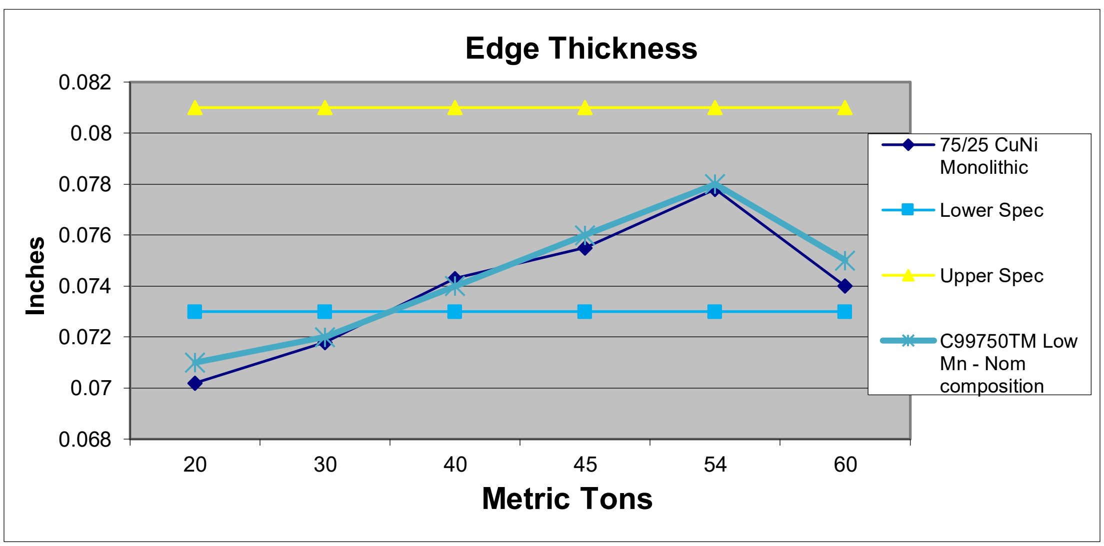
At the completion of tonnage progression striking, at least 400 planchets from each test lot were stamped at high speed at the appropriate circulating tonnage. The resulting test pieces were used to conduct further post coining tests (100-Cycle Wear Test, Coin Acceptor Drop Tests). These test pieces will also be provided to Coin Acceptor Manufacturers (CAMs) for external validation testing.

On the next few pages, *Graph 8: Tonnage Progression Srikes of 5-Cent CC99750TM Low MN, Graph 9: Tonnage Progression Strikes of 10-Cent 99750TM Low MN,* and *Graph 10: Tonnage*

Progression Strikes of 25-Cent 99750TM Low MN show that overall coinability of C99750 TM Low Mn for all denominations was similar to that of standard 75/25 cupronickel planchets.

Graph 8: Tonnage Progression Strikes of 5-cent C99750TM Low Mn

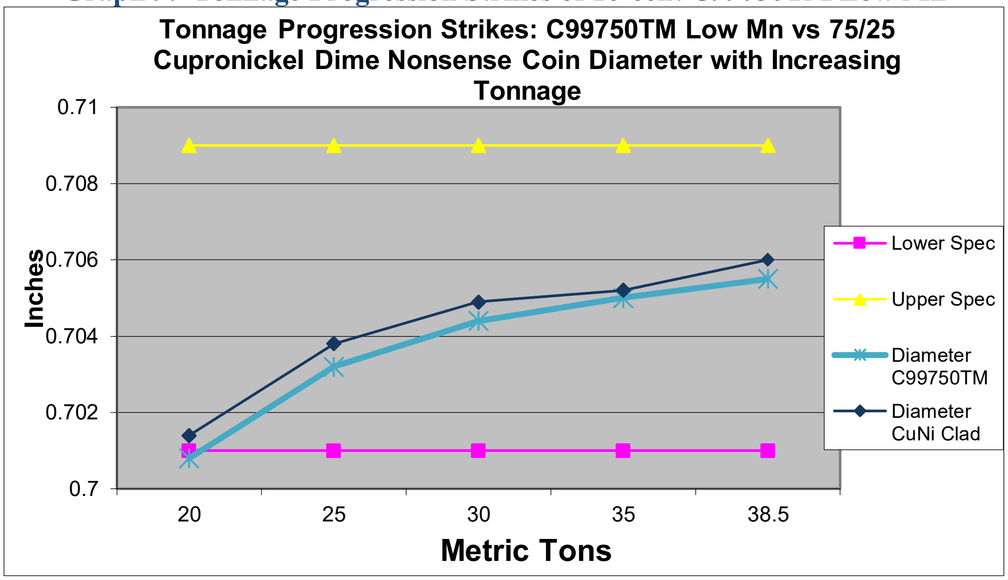


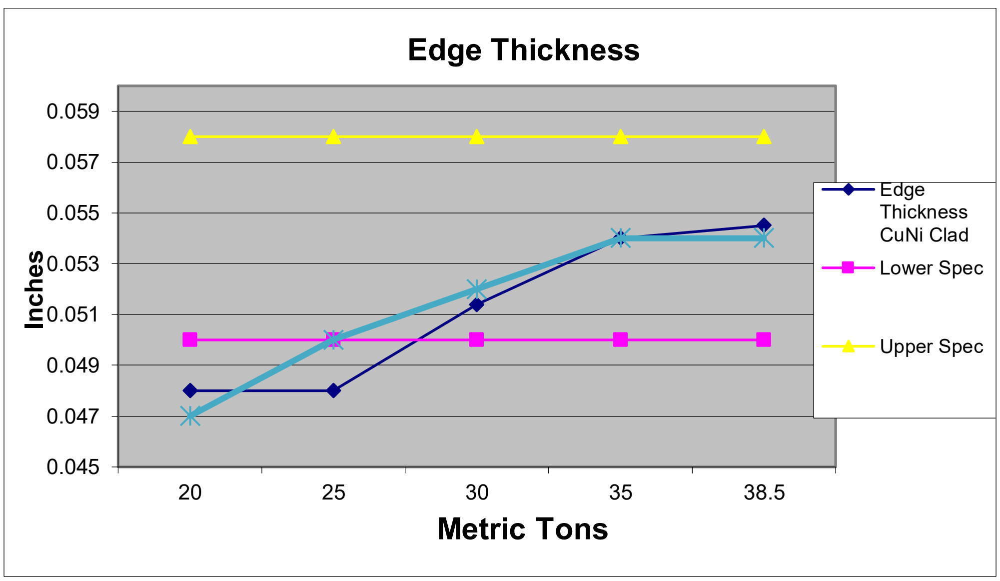


Comments:

1. Production stamping tonnage is 54 metric tons (MT) for incumbent 75/25 cupronickel 5-cent (baseline).
2. Progression strikes indicated acceptable design and dimensional fill at 54-55 MT for C99750TM Low Mn.
3. Overall coinability of C99750TM Low Mn 5-cent planchets was similar to that of standard 75/25 cupronickel planchets.

Graph 9: Tonnage Progression Strikes of 10-cent C99750TM Low Mn

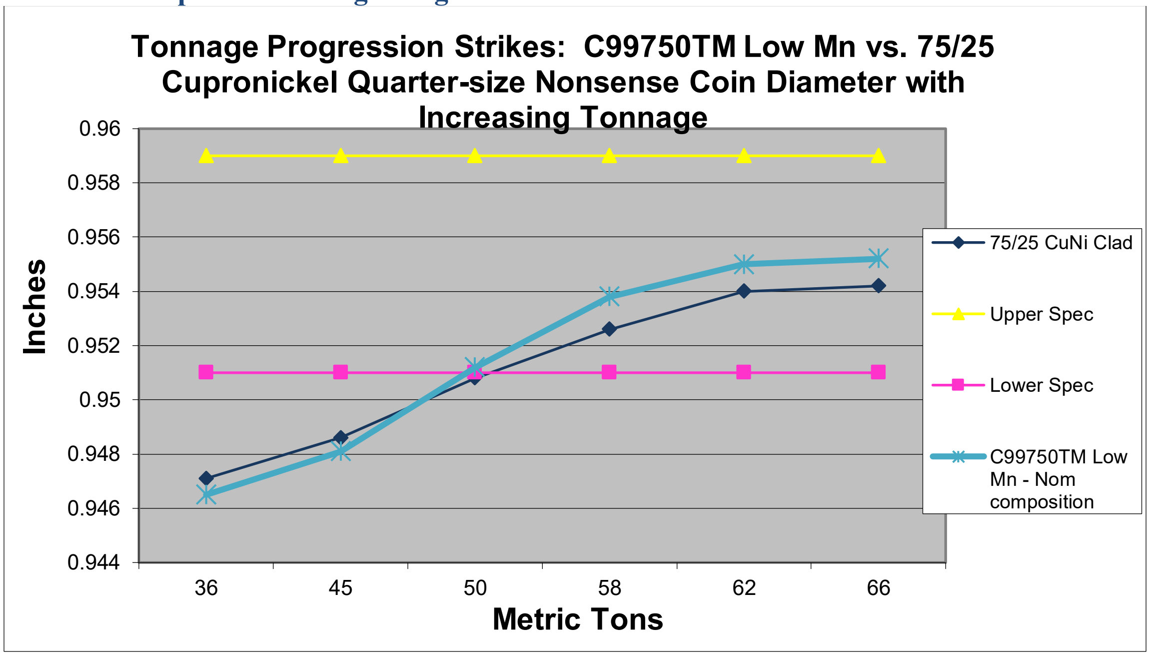


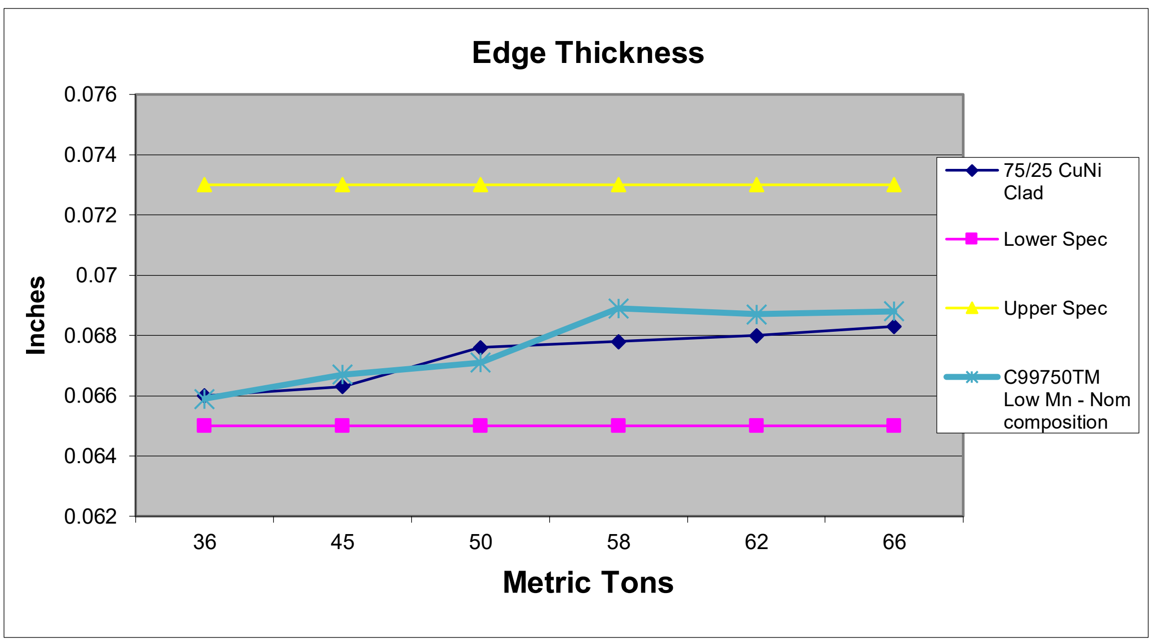


Comments:

1. Production stamping tonnage is 34-38 metric tons (MT) for incumbent 75/25 cupronickel 10-cent (baseline).
2. Progression strikes indicated acceptable design and dimensional fill at 36 MT C99750TM Low Mn.
3. Overall coinability of C99750TM Low Mn 10-cent planchets was similar to that of standard 75/25 cupronickel planchets.

Graph 10: Tonnage Progression Strikes of 25-cent C99750TM Low Mn





Comments:

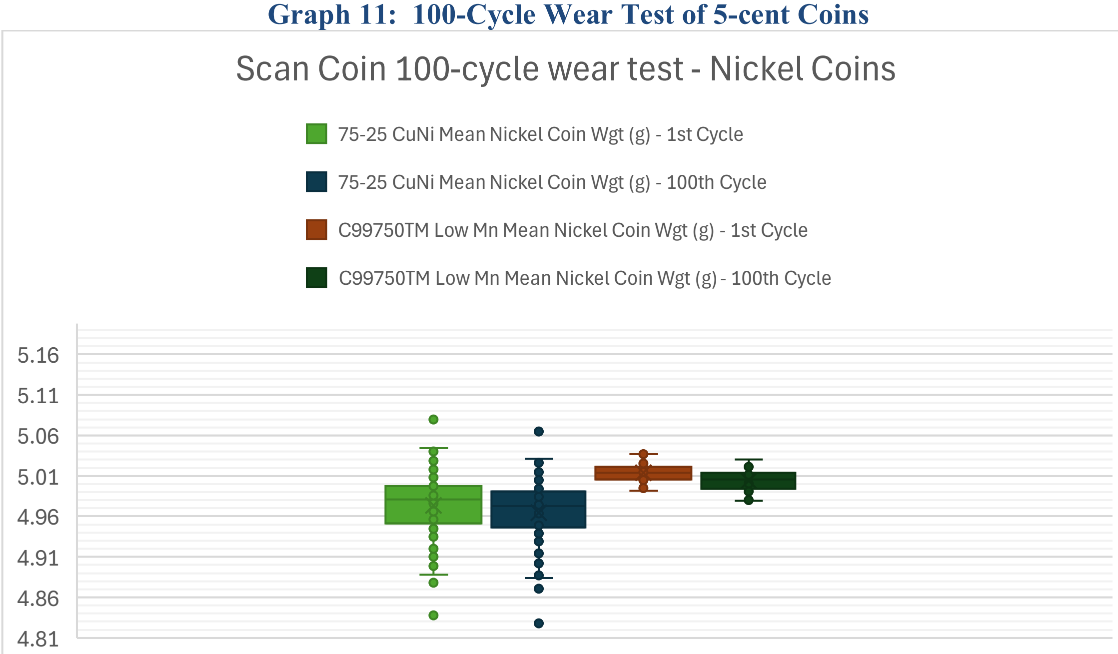
1. Production stamping tonnage is 62-64 metric tons (MT) for incumbent 75/25 cupronickel 25-cent (baseline).
2. Progression strikes indicated acceptable design and dimensional fill at 62 MT C99750TM Low Mn.
3. Overall coinability of C99750TM Low Mn 25-cent planchets was similar to that of standard 75/25 cupronickel planchets.

Test 5: Scan Coin 100-Cycle Wear Test

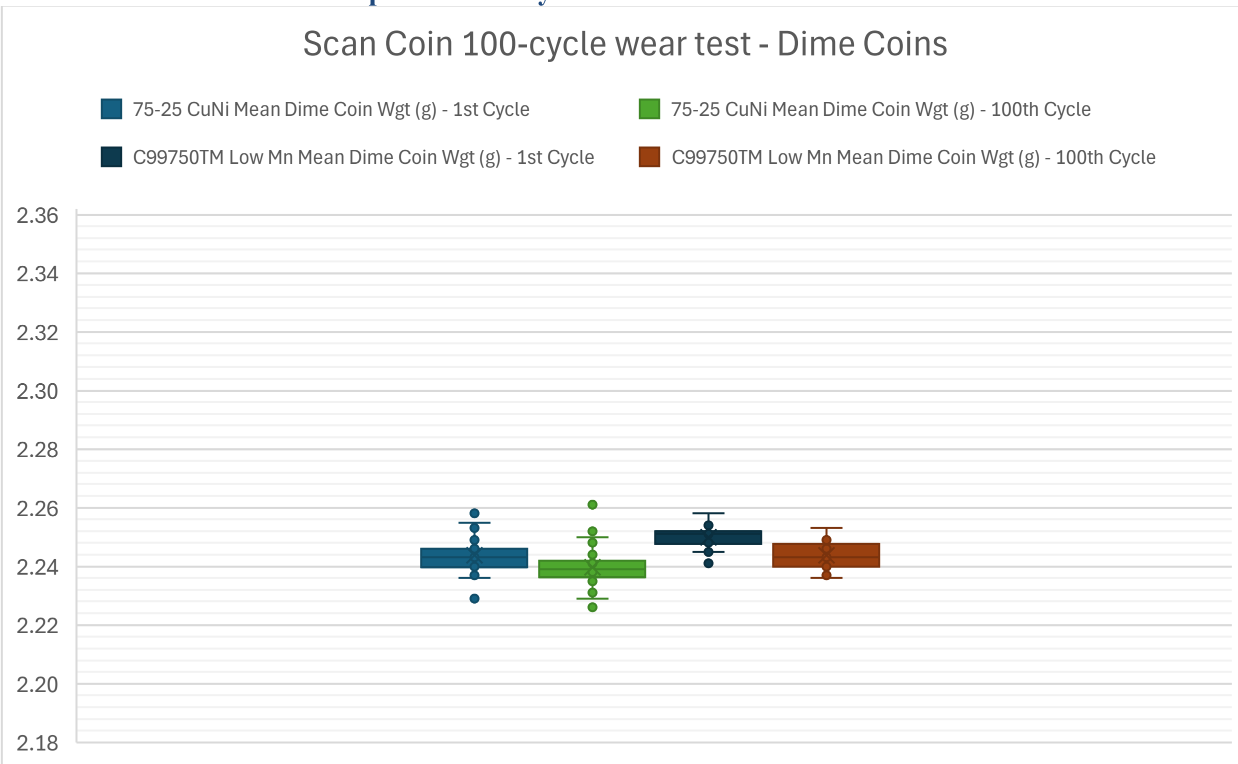
The Mint took 100 test pieces from each lot/denomination of C99750TM Low Mn and processed them once through the Scan Coin ICP-9 high speed Electronic Coin Sorter and measured the pieces' diameter, edge thickness, and inner and outer conductivities. The Mint then ran those same pieces through the electronic coin sorter 100 times to simulate real-life wear that circulating coins experience over a 30-year period of being counted and sorted.

The samples were measured at the end of the 100 runs through the electronic coin sorter for the same parameters as they were on their first run. One hundred percent of coins for all denominations and test lots were accepted as good coins after 1st cycle testing and 100th cycle testing (i.e., 100 percent acceptance rates). All pieces showed similar (acceptable) wear as that shown by the current material in the same test. All C99750TM Low Mn pieces showed minimal weight loss after wear testing, comparable to that for incumbent coinage metals. These wear and weight loss results suggest C99750TM Low Mn durability should be comparable to 75/25 cupronickel. Below and on the next page *Graph 11: 100-Cycle Wear Test of 5-Cent Coins*, *Graph 12: 100-Cycle Wear Test of 10-Cent Coins*, and *Graph 13: 100-Cycle Wear Test of 25-Cent Coins* indicate that all denominations showed acceptable wear test.

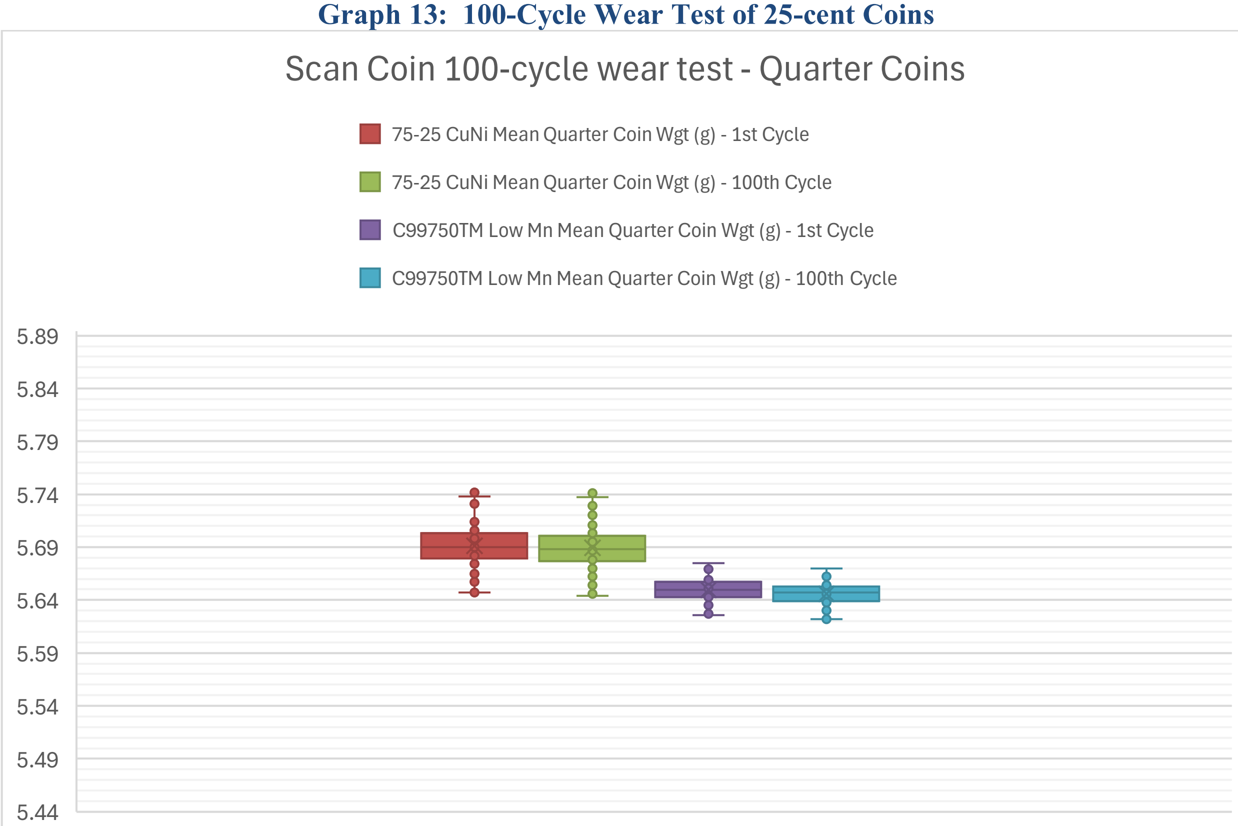
Graph 11: 100-Cycle Wear Test of 5-cent Coins



Graph 12: 100-Cycle Wear Test of 10-cent Coins



Graph 13: 100-Cycle Wear Test of 25-cent Coins



Test 6: Coin Acceptor Drop Testing

Prior to conducting 100-cycle wear testing, 100 test pieces from each denomination test lot were dropped through multiple coin acceptors, representative of the installed base of acceptors in the United States. Analysts recorded the percentage of pieces accepted or rejected. Pieces rejected during the first round of drop testing were retested, and a second round accept/reject rate was calculated.

After completion of 100-cycle wear tests, drop tests were repeated with wear tested pieces. Drop test results are tabulated below in *Table 5: Acceptance Rate of Newly Minted and Wear Tested C99750TM Coins*. Five-cent cupronickel reference coins representing the conductivity tolerance range for C713 alloy were drop tested and acceptance rates compared to those of C99750TM Low Mn (low, nominal and high compositions). Acceptance rates for the two alloy types were comparable, indicating that C99750TM composition variations to be expected during large-scale manufacturing will be within the existing tolerance range of C713 cupronickel alloy.

Finally, the acceptance rates of all newly minted and wear tested C99750TM pieces were comparable to those rates for incumbent materials.

Table 5: Acceptance Rate of Newly Minted and Wear Tested C99750TM Low Mn Coins

C713 CuNi reference coins 5-cent	% Acceptance	
	Initial Test	Second Test
High alloy composition	99%	100%
Nominal composition	100%	na
Low composition	95%	100%

C99750TM Low Mn 5-cent	% Acceptance of New Coins		% Acceptance of Wear Tested Coins	
	Initial Test	Second Test	Initial Test	Second Test
High alloy composition	99%	100%	100%	na
Nominal composition	100%	na	100%	na
Low composition	95%	100%	96%	100%

C99750TM Low Mn 10-cent	% Acceptance of New Coins		% Acceptance of Wear tested Coins	
	Initial Test	Second Test	Initial Test	Second Test
High alloy composition	99%	100%	100%	na
Nominal composition	97%	100%	99%	100%
Low composition	99%	100%	100%	na
75/25 CuNi clad 10-cent	100%	na	100%	na

C99750TM Low Mn 25-cent	% Acceptance of New Coins		% Acceptance of Wear tested Coins	
	Initial Test	Second Test	Initial Test	Second Test
High alloy composition	100%	na	100%	na
Nominal composition	100%	na	100%	na
Low composition	100%	na	100%	na
75/25 CuNi clad. 25-cent	99%	100%	100%	na

Results of all Internal Phases of Testing:

C99750TM Low Mn has passed all tests as a seamless alternative.

Next Phase Test: External Coin Acceptor Manufacturer Testing

The Mint is testing batches of one hundred nonsense test pieces of each denomination that were chosen from low, nominal, and high composition lots. This testing consists of at least nine batches per denomination and over 2,700 total nonsense pieces. In September 2024, those pieces were sent to at least three separate coin-acceptor manufacturers (CAMs for validation testing.

Appendix 2: Additional Information on Engineering Assessments Regarding Production Improvements (2022-2024)

Application of Physical Vapor Deposition (PVD) Coatings onto Work Hubs

Physical Vapor Deposition is a vacuum process used to deposit very thin films onto a substrate. An ionized gas molecule is used to displace atoms of a specific material, typically chromium metal. Chromium atoms then react with nitrogen gas at near vacuum pressure to form chromium nitride molecules, which bond at the atomic level to the die and create a thin film. Since 2010, the Mint has successful utilized PVD technology to coat numismatic coining dies, resulting in increased die life and improved numismatic coin quality.

Coining die manufacturing at the Mint is based on hubbing technology. Hubbing is a cold-working process that involves using a hardened punch to stamp a cylindrical metal blank. The punch, or work hub, penetrates the workpiece at a low speed, below the melting temperature of the metal. This process is used to create recessed design and lettering in dies for stamping. The amount of force – hubbing tonnage – needed to create acceptable recessed design/lettering is determined by die blank hardness, toughness, and the amount of friction between the work hub and die blank.

The coefficient of friction (CoF) is a ratio that measures the amount of friction between two surfaces. It is the ratio of the frictional force that resists the motion of the surfaces to the normal force that presses them together. A low coefficient of friction means that less force is required to hub die blanks than a high coefficient of friction.

Currently, work hubs are not coated. Uncoated hardened steel work hubs are used to hub uncoated steel die blanks. The CoF at the interface of these uncoated parts can be as high as 0.75. PVD coating work hubs with chromium nitride can lower the interface CoF to as low as 0.40. This lower CoF should increase work hub life by lowering hubbing tonnage and enable hubbing of difficult to form design/lettering.

A project is underway at the Denver Mint to install a turnkey cleaning line and PVD coating system to coat work hubs with chromium nitride coatings. This application has been successfully used at several foreign Mints, most notably the Royal Canadian Mint.

The Denver Mint hub cleaning line and PVD coating system should become fully operational during FY 2025.

Coin Blank Finishing Optimization

Cupronickel coinage metals are received at Mint production facilities in the form of sheets wound into coils. These coils are subjected to the following process steps prior to stamping into coins:

1. Coils are unwound, straightened, and blanked to form metal disks (coin blanks).
2. Coin blanks are annealed in rotary furnaces to soften to allow lower stamping tonnage necessary to form into coins.
3. Annealed, softened coin blanks are cleaned to remove metals oxides (rust) formed during anneal and the application of anti-tarnish/blank lubricant (blank finishing).
4. Coin blank edges are rimmed (upset) to more easily form the coin rim during stamping.

Collectively, the process steps listed above comprise the BAU operation (Blank, Anneal, Upset) prior to stamping.

The BAU operation consumes significant quantities of chemicals and water to clean and finish blanks after annealing. An initiative is underway to optimize annealing and finishing processes to reduce chemical/water consumption and the amounts of metals introduced into the wastewater streams at the Mint production facilities at Philadelphia and Denver. Annealing optimization consists of transitioning to more protective annealing atmospheres within rotary furnaces to reduce metal oxide foundation. Annealing optimization will be followed by development of blank finishing processes tailored to consume less chemicals and water without compromising coin blank anti-tarnish and lubrication performance.

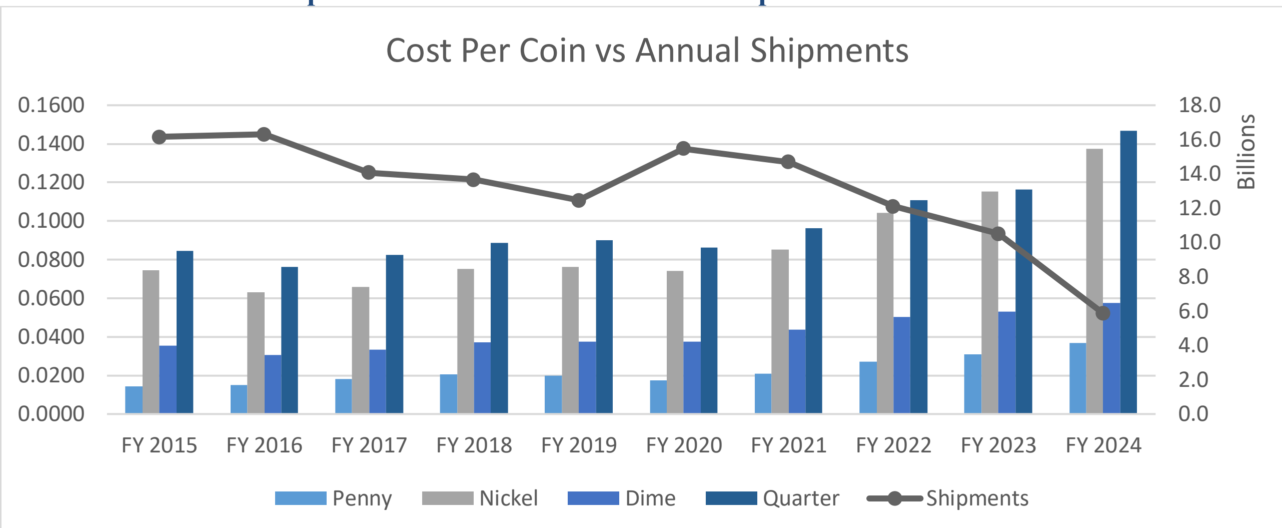
Preliminary optimization trials conducted during CY2023 and CY2024 suggest the potential of reducing chemical consumption by as much as 25 percent. A corresponding reduction in wastewater metal content is expected.

BAU optimization is scheduled for completion during CY2025.

Appendix 3: Additional Information on Production Cost of Circulating Coins

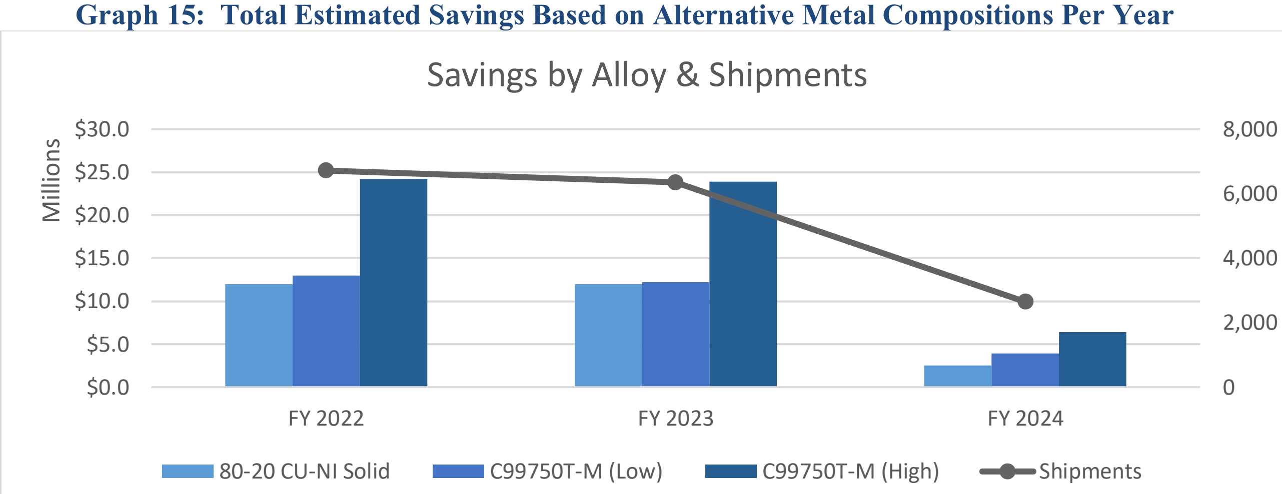
For current circulating coins, *Graph 14: Cost Per Coin vs. Annual Shipments to the FRB* shows data from FY 2015 through FY 2024. In recent years, shipments have decreased to the FRB, which shows cost per coin increasing.

Graph 14: Cost Per Coin vs Annual Shipments to the FRB



Considering the changes in orders by the FRB impacting the cost per unit, *Graph 15: Total Estimated Savings Based on Alternative Metal Composition Per Year* shows the impact on the cost savings over the last three years for the alternative metal compositions 80/20 and C99750TM.

Graph 15: Total Estimated Savings Based on Alternative Metal Compositions Per Year



Below, *Table 6: Actual Production Per Year for Nickel, Dime, and Quarter Denominations and Savings Comparison for Alternative Metals* expounds on unit costs from FY 2022 to FY 2024 and compares them to various alternative compositions.

Table 6: Actual Production Per Year for Nickel, Dime, and Quarter Denominations and Savings Comparisons for Alternative Metals

Five Cent	FY 2022	FY2023	FY2024	FY 2022 Savings *In Millions*	FY 2023 Savings *In Millions*	FY 2024 Savings *In Millions*
Coins Shipped (*In Millions*)	1,442	1,416	202			
Actual Per Unit Cost	0.1040	0.1154	0.1375			
80/20 (CU/NI) Per Unit Cost			0.1346	$5.9	$6.2	$0.6
C99750TM (Low MN Variant) Per Unit Cost	0.0996	0.1110	0.1333	$6.3	$6.2	$0.8
C99750TM (High MN Variant) Per Unit Cost	0.0955	0.1066	0.1305	$12.3	$12.5	$1.4
Ten-Cent	**FY 2022**	**FY2023**	**FY2024**	**FY 2022 Savings *In Millions***	**FY 2023 Savings *In Millions***	**FY 2024 Savings *In Millions***
Coins Shipped (*In Millions*)	2,849	2,666	840			
Actual Per Unit Cost	0.0503	0.0530	0.0576			
80/20 (CU/NI) Per Unit Cost	0.0497	0.0523	0.0572	$1.7	$1.9	$0.3
C99750TM (Low MN Variant) Per Unit Cost	0.0496	0.0523	0.0570	$2.0	$1.9	$0.5
C99750TM (High MN Variant) Per Unit Cost	0.0490	0.0516	0.0566	$3.7	$3.7	$0.8
Quarter Dollar	**FY 2022**	**FY2023**	**FY2024**	**FY 2022 Savings *In Millions***	**FY 2023 Savings *In Millions***	**FY 2024 Savings *In Millions***
Coins Shipped (*In Millions*)	2,426	2,274	1,605			
Actual Per Unit Cost	0.1109	0.1163	0.1468			
80/20 (CU/NI) Per Unit Cost	0.1091	0.1146	0.1458	$4.4	$3.9	$1.6
C99750TM (Low MN Variant) Per Unit Cost	0.1090	0.1145	0.1452	$4.6	$4.1	$2.6
C99750TM (High MN Variant) Per Unit Cost	0.1075	0.1129	0.1442	$8.2	$7.7	$4.2

Estimated Total Savings with Alternative Metals	FY 2022 Savings *In Millions*	FY 2023 Savings *In Millions*	FY 2024 Savings *In Millions*
80/20 (CU/NI) Per Unit Cost	$12.0	$12.0	$2.5
C99750TM (Low MN Variant) Per Unit Cost	$12.9	$12.2	$3.9
C99750TM (High MN Variant) Per Unit Cost	$24.2	$23.9	$6.4

On the next page, *Table 7: Cost Savings Assessment for 80/20 Cupronickel and Variations of C99750* shows the per unit cost estimates passed on actual annual volumes and the potential savings in FY 2024. These savings, due to volume, are lower than those estimated in the 2022 Biennial Report but still show savings over the current metallic content.

Table 7: Cost Savings Assessments For 80/20 Cupronickel and Variations of C99750TM

80/20 (CU/NI)	Actual Annual Volume. *In Millions*	Per Unit Cost Est. FY 2024	Per Unit Cost Est. C99750TM (Low)	Estimated Savings Compared to FY 2024 *In Millions*
Five-Cent	202	$0.1375	$0.1346	$0.6
Ten-Cent	840	$0.0576	$0.0572	$0.3
Quarter Dollar	1,605	$0.1468	$0.1458	$1.6
Total Savings	na	na	na	$2.5
C99750TM (Low Mn Variant)	**Actual Annual Volume. *In Millions***	**Per Unit Cost Est. FY 2024**	**Per Unit Cost Est. 80/20**	**Estimated Savings Compared to FY 2024 *In Millions***
Five-Cent	202	$0.1375	$0.1346	$0.8
Ten-Cent	840	$0.0576	$0.0570	$0.5
Quarter Dollar	1,605	$0.1468	$0.1452	$2.6
Total Savings	na	na	na	$3.9
C99750TM (High Mn Variant)	**Actual Annual Volume *In Millions***	**Per Unit Cost Est. FY 2024**	**Per Unit Cost Est. 80/20**	**Estimated Savings Compared to FY 2024 *In Millions***
Five-Cent	202	$0.1375	$0.1305	$1.4
Ten-Cent	840	$0.0576	$0.0566	$0.8
Quarter Dollar	1,605	$0.1468	$0.1442	$4.2
Total Savings	na	na	na	$6.4

United States Mint
Department of the Treasury

2024 Biennial Report
to Congress

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Washington, DC
20220