

Market Analysis Report Information

Cold Storage 2019

~Key requirements for developing enterprise optical storage



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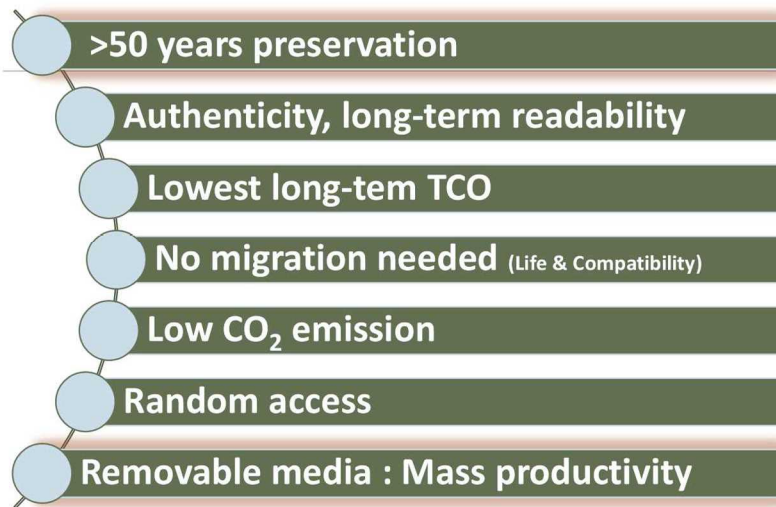
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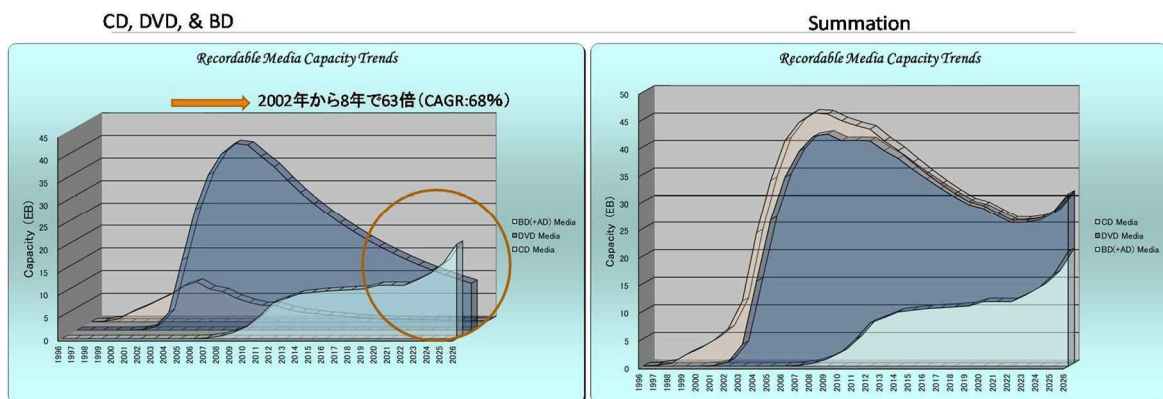
1. Introduction

The importance and advantages of optical storage including long-term preservation, is described in the following figure. Furthermore, optical discs are a removable media, and the Companies are able to expand capacity supplies to market by increasing the manufacturing capacity of optical discs. DVD-R responded to market's needs by producing 8 billion discs annually worldwide. In this report, the analysis was carried out based on the fact that the production stage that makes the best use of the advantage will come in the enterprise market.

Advantages of Optical storage



Total Recordable Media Capacity Yearly Trends (EB)



2. Executive summary

2.1. Major Analyses of this Report

The purpose of this report is to analyze the following in detail and to show the roles, positions, importance, and future growth trends of optical storage in cold storage, which accounts for most of enterprise market.

- Detailed Analysis of Cold Storage in Enterprise market for market Supply Trends
- Analysis of Storage as a whole, including SSD, HDD, Optical storage, and LTO
- Trend analysis of market, technology and capacity supply ability in future of each storage
- Analysis of Storage Tier Shifts and Storage Selections in Enterprise storage market
- Application Analyses of Optical Disc Storage from performance and its expected market
- More Probable Optimistic and Long-Term Predictions for Optical Disc Storage

2.2. Outline of Analysis Results of Cold Storage Trends

FIG. 1 summarizes the main materials that serve as points.

Upper left: Worldwide accumulated total storage capacity trend

Lower left: Expected market for optical disc storage that has become clear from performance

Upper right: Tier shifts for enterprise market storage

Lower right: Optimistic and Long-term Forecasting of Optical Disc Storage

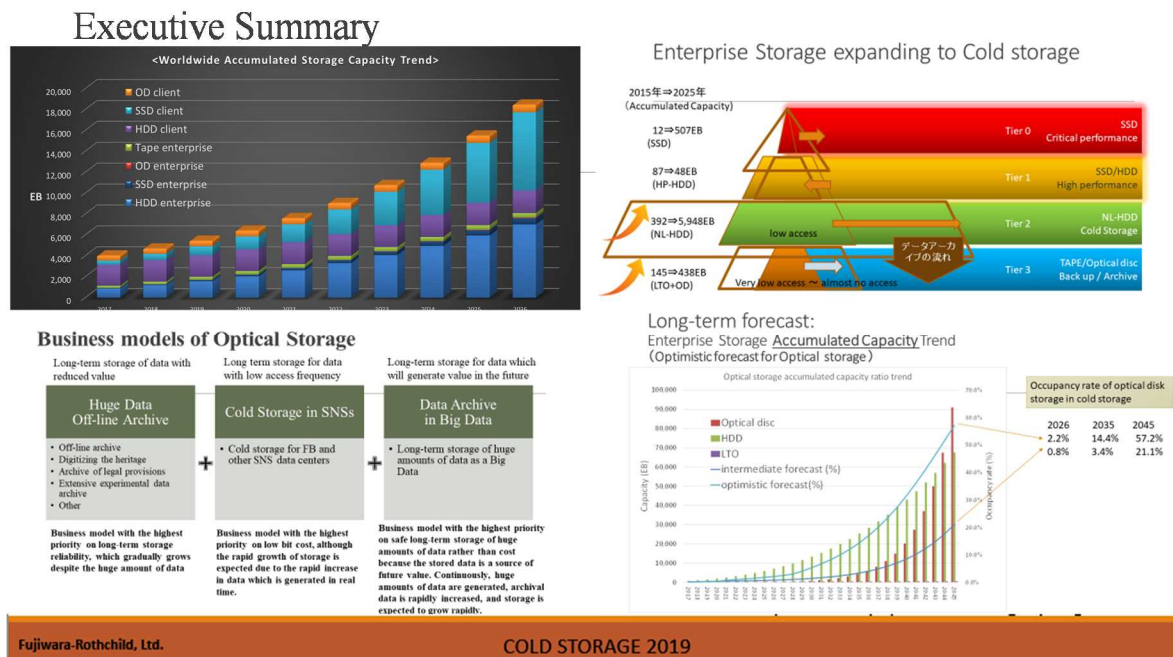


FIG. 1 Executive Summary

- Analysis of total capacity supply trend of SSD, HDD, Optical storage, and LTO

The storages with the greatest capacity availability are NAND flash in clients and HDD-NL in enterprise market. In 2026, the operating storage capacity is to be 18.5ZB.

- Detailed Analyses of Cold Storage in Enterprise market

The main device of cold storage is the HDD-NL, which will be about 7ZB as operating capacity in 2026, accounting for 87% of the capacity of cold storage. Optical disc storage is expected to reach 65EB in 2026, 0.8% capacity share, based on a modest forecast of the current extension.

- Trend analysis of market, technology and capacity supply ability in future of each storage

There have been incidents that could affect the capacity of market in the future, such as delays in the introduction of market in HAMR/MAMR in HDD and delays in the introduction to market of LTO-8. For optical storage, the next technology strategy of AD's current capacity roadmap is important. Super multi-layer will be up to 300TB as a future trend.

- Storage Tier Shifts and Storage Selections in Enterprise storage market

Enterprise market forecast shows the HDD-NL capacity-supply trend is relatively large compared with other storages, so that the Tier2 as a Cold storage including Warm is expected to grow very rapidly. And the growth of Tier3, Deep archive, is expected to be suppressed. Paradoxically, our report shows that it will be needed to expand storage capacity to satisfy the requirements of the Tier3 to be expanded. Optical disc storage requires more capacity supply to enhance its production capacity than conservative forecast of the current extension. The capacity expansion of HDD-NL alone greatly increases the gap with the rapidly expanding IDC global data sphere capacity prediction.

- Application analysis and expected market of optical disc storage that has become clear from performance.

Three major applications of optical disc storage include offline archiving, SNS data centers, and big data storage as expected market in the future, including achievements. In the situation until the first half of 2019, the steady expansion of offline storage, the temporary stagnation of SNS (expecting cost reduction due to larger capacity), and the rapid expansion of big data usage are appearing in the data very clearly. In addition, the aggressiveness of the Chinese market stands out, and this situation will continue to expand for the time being.

- More probable optimistic and long-term predictions of optical disc storage

The storage supply to Tier 3 will be significantly short in the future. The optical disc has sufficient capability to expand its production capacity. According to the optimistic forecast, which is made by expanding capacity supply to market by combining annual production capacity of 30 million to 50 million pieces and capacity expansion of AD discs in response to the demand for increased capacity supply of Tier3, the capacity ratio of cold storage is 2% in 2026 (the current forecast is 0.8%), 10% in the mid-2030s, and 30% in 2040. As a result, the Actual Operation Storage of the entire cold storage can be expanded.

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