Cyon Research ™

**Managing AEC Print Workflow –
A Look at Océ Repro Desk® Professional**

A Cyon Research White Paper
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Executive Summary

Ocè Repro Desk Professional is a software tool for reprographic firms and their customers to streamline the production and workflow of printed documents. In this white paper, Cyon Research addresses the issues that this software is designed to resolve and looks at the software in that context.

What problem does the Océ solution attempt to solve?

Despite advances in information technology (IT), Architecture/Engineering/Construction (AEC) must continue to rely on a paper-based workflow to deliver documentation to the jobsite. In a previous white paper on AEC digital data, Cyon Research identified the value of an all-encompassing solution serving all project team members. The same is true for drawings delivered to the jobsite.

A variety of point solutions are available for aspects of print creation, print management, and print distribution. When they are applied without regard to the overall workflow, work can be shifted from one party to another, management and responsibility issues become confusing, and frustrations rise. The use of CAD plot files as a substitute for paper originals creates special challenges if not managed as part of a comprehensive workflow. When AEC firms start playing mix-and-match with document production and distribution, the chances are slim that the most efficient, reliable, repeatable, and cost-effective solution will be chosen.

How has that problem been addressed in the past?

Traditionally, professional reprographic shops managed construction print workflows based on paper originals. Before computers became drafting tools, someone in the architect's office would gather the sheets for a project, bundle them, and send them to a reprographer. Drawings would be copied and sets delivered or made available for sale to contractors. Today the architect creates electronic plot files from CAD drawings. Sometimes they go directly to the reprographer, sometimes not. If the plot files do not go to the reprographer, then a new workflow must be implemented. More often than not, this new workflow shifts work within the process rather than removing it through automation.

What types of solutions are currently used or proposed in the market?

Many solutions and processes are being applied to construction print management; most were not designed specifically as print-management solutions. Printers have replaced copiers as the primary tool of reprography; this is a procedure change that has not necessarily solved print-management issues. Web-based project extranets, project-

management software, and electronic document-management solutions are all being used to manage construction paper workflow, but none were designed for the purpose.

What is the nature of Océ's solution to the problem?

Océ, the largest supplier of printing and copying technology to the AEC industry, believes the best way to improve construction print workflow is to put reprographers at the center of a seamless, integrated end-to-end process using the latest IT. Océ Repro Desk Professional is designed to manage print creation, print-production management, and print distribution. It seeks to automate construction-print workflow from the desktop to the print room to the job site. The goal is to make it as easy and efficient as possible for AEC firms to get prints to the right people at the right time for the least total cost.

What is Cyon Research's opinion of Océ's solution?

Océ Repro Desk Professional wages technology jujitsu on behalf of AEC, by leveraging disruptive forces to create new, more effective workflows for print creation, print production management and print distribution. It is a thoughtful, seamless, and full-service approach to IT for construction printing; it is a win-win for all involved.

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The construction industry is feeling the full force of the winds of change reshaping 21st century commerce. Technological innovations and business-process disruptions impact every step in AEC (architecture/engineering/construction). The rapid growth in design/build projects, creation of new business-relationship models, and the increased use of information technology (IT) are both cause and effect of the profound changes at work.

What has not changed is that drawings on paper are crucial to every project. There is no display technology at any price that matches the ordinary "D"- or "E"-sized plot for clarity, portability, and utility. Until we have WiFi-enabled flat displays that can be unrolled on a truck hood or stored in a tool box, drawings on paper will remain. Getting the right information to the right people efficiently remains the key issue.

Plots are as important as ever, but the pressures of innovation have created new expectations regarding their creation, management, and distribution. CAD programs automate design and drafting, but are less efficient at print creation, and offer no help at all for print-production management and print distribution. Piecemeal adoption of information technology (IT) by project partners disrupts work flow. The rise of ubiquitous global communications leaves everyone frustrated with the cost and speed of document delivery, by comparison.

Océ is a vendor of printing and copying technology to the AEC industry and has recently released a new generation of software and services, Océ Repro Desk Professional, to address these issues. Océ believes Océ Repro Desk Professional offers new and more-effective workflows and tools for managing AEC printing workflow from the desktop to the print room to the job site. In this white paper, Cyon Research examines their claim and offers its independent appraisal.

The Nature of the Problem

Traditional Construction-Print Workflows

Traditionally, professional reprographics shops managed construction-print workflows based on paper originals. Before computers became drafting tools, someone in the architect's office would gather the sheets for a project, bundle them, and send them to a reprographer, where copies would be made. Work on the project would stop while the originals were out of the office.

It was the reprographer's responsibility to make faithful copies of the originals and to organize them for distribution to the general contractor, the various subcontractors and other parties. Changes to the project required the process to be repeated.

The Challenge of Information Technology

The same pressures changing AEC workflows and expectations today are also affecting reprography. There is market pressure to reduce prices without reducing services. Digital file formats are expanding in number and purpose, complicating a workflow in transition; meanwhile, technology is reducing the total number of plots required for a project.

There is a shift from copiers to printers as the primary tools of reprography. The portability of digital drawings means that AEC firms frequently print their own plots, often without thought given to the management or cost of this procedural change. The rise of such a "distribute then print" workflow causes more print jobs per project, but each job is generally smaller and more complex.

Often today the architect creates electronic plot files from design originals. Plot files (also known as PLT files) are an interpretation of a CAD file for the purpose of printing. Plot files for the various brands of wide-format printers vary. Despite years of work by CAD developers and printer manufacturers, creating a 100%-faithful plot file from the digital original is still occasionally problematic.

The use of plot files creates several "pain points" in the AEC workflow. First are the print-creation issues. Before computers, it was the reprographer's burden to accurately reproduce drawings. Now, it is the architect who must make sure the plot file is accurate before sending it to the reprographer. Using native design applications, there is no satisfactory WYSIWYP ("what you see is what you print") preview short of printing on-site. Time and materials are spent ensuring plot files are accurate.

Once the plot files are confirmed, the designer must decide how to manage the printing. Do the plot files go to a reprographer? If so, are they configured correctly for the reprographer's equipment? Will the reprographer handle distribution or will the architect? Instead of using a reprographer, will the files be distributed electronically to the various contractors? If so, in what format?

Then there is the issue of plot distribution. If the plots are digital until they reach their final user (sometimes called "deliver then print"), they can be sent via hosted extranet service, point-to-point electronic delivery using Internet File Transfer Protocol (FTP), or email. Will the recipients print them or only view them online? If the architect chooses to be the reprographer, will the firm send drawings via common carrier or courier? How will it charge each contractor for drawings? Each decision has its own set of management, security and cost issues to consider.

The new technologies of printing and file distribution, plus the rise of next-day delivery, have added many new decision-point variables to the workflow path. One innovation by itself can offer a specific benefit. But when AEC firms start playing technology mix-and-match with document production and distribution, the chances are slim that the firm will nail down the most efficient, reliable, repeatable, and cost-effective solution.

Solutions Currently Used or Proposed in the Market

A Different Solution for Every Project

Many firms continue to use traditional reprographic services, either by printing an original set of drawings from their CAD software or by delivering plot files as described earlier. To stay competitive, more and more reprography shops are becoming members of regional or national networks or are being acquired to become part of a chain.

A variety of point solutions have arisen in recent years that compete with aspects of the services traditionally provided by reprographers. None of them were developed specifically to compete with reprography.

Project extranets are offered by Web-based Application Service Providers (ASP's). They provide a digital location for shared access to project documents—not just drawings but also contracts, specifications, site maps, and any other digital documentation. Some also feature project-management tools such as construction timelines.

Access is generally by invitation, and the extranets use strong security measures to protect file access. Web-based collaborative solutions are designed to manage and distribute electronic documents but do not control or automate the thorny problem of getting the plots right.

Project-management and document-management software products are based on a firm's server or on a single desktop computer. These products are primarily about tracking and managing projects and provide some file-distribution features. They are not specifically designed to manage construction document workflow.

Low-volume wide-format printers have come down in price; some A/E firms are using them to bring their printing in-house. This makes print creation an in-house issue but doesn't address print-production management or print distribution.

Solutions Stretched Beyond Their Designed Purpose

Each of these non-reprographic solutions can fill part of the process traditionally handled by reprographic shops, but limitations appear quickly. Project extranets are designed for the exchange of digital files but don't have the tools to tweak a plot file for local printing.

There is also the problem of what file formats to share: native CAD files, various interoperability file formats, or publication formats such as Adobe PDF or Autodesk DWF. If project members decide to substitute an extranet for the services of a reprographer, then each team member must have suitable output devices. That's not usually a problem for most paperwork, but drawing files generally require wide-format printers, and wide-format printers generally require staff to operate them.

Project-management software is designed to manage construction, not printing. Tracking the cost and time of printing is not part of the product. Document-management solutions are designed to control access to files during the creative process and are not targeted to handle distribution issues after design is finished.

We know of only two other software systems that address these issues. Contex, a Scandinavian firm represented in the US by Ideal, has a variety of software solutions designed to address individual issues described above. Océ's earlier version of Océ Repro Desk also provided software to address individual issues of these problems. This next generation of Océ's software, Océ Repro Desk Professional, is the first attempt we are aware of to address the complete problem with a single, integrated solution set.

The Nature of Océ's Solution to the Problem

Rebuilding the Reprographic Workflow with IT

Océ is a $3B+ supplier of printing and document management products. Océ's Wide Format Printing Systems (WFPS) division offers the AEC industry products for high-volume production. Reprographics firms make up a large proportion of Océ's customers. In its research on large-volume construction-print workflow, Océ concluded that the best way to improve the process would be to put reprographers at the center of a seamless, integrated end-to-end process using the latest technology. Océ's new Océ Repro Desk Professional software is the result of that research.

Océ Repro Desk Professional offers a three-part solution for print creation, print-production management, and print distribution. It seeks to manage print workflow from the desktop to the print room to the job site. The goal is to make it as easy and efficient as possible for AEC firms to get prints to the right people at the right time.

Print Creation

Print creation starts with the designer drawings and moves to the actual production of individual plots. There are several steps:

- Extracting details from CAD (vector) or illustration (raster) files for each sheet
- Previewing sheets to ensure full fidelity
- Combining sheets into a set
- Establishing (if known) the print recipients
- Submitting a work-order form

Océ Repro Desk Professional includes free print preparation and submission software called Océ Client Tools that reprographic shops pass along to their clients at no cost.

Designers[1] can drag-and-drop native CAD files (including DWG, DGN[2]),
interoperability files (including DXF) or publishing formats (including PDF and DWF)
directly into Océ Client Tools. There is no longer a need for the designer to assemble
drawings and "Print to File" to create PLT files. Océ Client Tools also provides print-
preview functionality that provides an accurate on-screen rendition of what the final plots
will look like (WYSIWYP). The ability to accurately preview drawings electronically
eliminates the need to create check plots, thus minimizing waste. This relieves the
architect and reprographer from having to manually ensure the print quality of drawings.

Print Production Management

Print-production management is the second step in the process. After selecting and
possibly reviewing the files to be plotted, the designer builds the print job virtually in Océ
Client Tools. The designer can add stamps or overlays, set all production properties for
the sheet set, and select the print destination for the sheet set.

Designers have several options when determining where to print their files. They can
print in-house to any small format printer up to 11" X 17". They can print in-house to any
wide format printer that is running Océ Repro Desk. Or they can send their files to a
reprographer of their choice using a feature called Direct Transfer.

If the design files need to be reprinted in the future with updates, Océ Client Tools has a
convenient "save-as" function that allows the files to be saved and recalled. Because the
saved files are pointers to the source files, the original print job can be recalled and yet
contain the most up-to-date revisions. This saves a designer time by eliminating the need
to recreate print jobs, with the added benefit of containing the most current revision.

Print Distribution

Print distribution is the final step in the process. To enable general contractors,
subcontractors or other invited parties to buy prints as needed, a designer uses Océ Plan
Center software, an on-line storefront for documents. From the desktop, the designer
publishes the documents to a web-accessible archive. The designer has access to projects
at all times; invited parties may only view and order from specified jobs.

Using Océ Direct Transfer, designers can print to multiple destinations, locally or
globally, as long as their reprographers also use Océ Repro Desk Professional. First the
designer selects the reprographer of choice and completes the reprographer's work order.
This ensures accurate transmission of the designer's needs and minimizes the need for the

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[1] We use the term "designer" here to represent the creation side of AEC team- the architect, engineer, job-
shop, or any other team member whose role involves the creation of drawings that will need to be printed
and distributed to other team members.

[2] Requires a 3rd party file processing plug-in.

reprographer to call the customer back for missing information.   The files are automatically uploaded to the chosen reprographer, who prints and distributes the job using Océ Repro Desk Professional.

Cyon Research's Opinion of the Océ Solution for Managing Construction Print Workflow

No More Assumptions about Workflow

The full application of information technology (IT) to an industry workflow has the result of increasing the value of information specialists. IT makes it easy for information creators and information consumers to more directly communicate. On the flip side, intermediaries in a specific business process workflow are of decreased value and often eliminated.

In the traditional construction-print workflow, the reprographer was the business and print-production specialist, the connection between designers and contractors. The piecemeal introduction of various IT tools and processes has indirectly started to marginalize reprographers in little steps, but without an over-arching strategy to improve the entire process. The construction industry seemed to be assuming that every new IT tool and process was a step in the right direction. This assumption ignores the unique reality of construction print workflow—paper is essential.

Moving print creation, print-production management, and print distribution to the information creators (architects and engineers) is not a process improvement, yet that is exactly what has been happening in some quarters.

Océ provides an intentional IT-based workflow for construction printing. It recognizes that the three steps in moving from design to plot are essential, and that reprographers are in the best position to manage the process. Océ's solution empowers designers and assists contractors without forcing them to take on new responsibilities as mini-reprographers.

In addition to the overall goal of an improved workflow, there are some specific features of Océ Repro Desk Professional that deserve special mention:

- Océ Client Tools allows the designer to focus on design, not print creation
- Océ Plan Center is a digital hub for reprographic processes and services
- Océ Direct Transfer makes all reprographics shops local to the designer

Highly Efficient Reprographic Workflow

By combining client-side desktop tools, Web access to print projects, and server-side reprographic automation, Océ Repro Desk Professional creates a highly efficient reprographic workflow. We believe it is the first comprehensive, integrated solution for volume construction printing that empowers all players in the process. Reprographics

firms that adopt this technology will have a strategic advantage to offer their clients. Designer firms that hire Océ Repro Desk-enabled reprographers will considerably reduce the time and expense they now devote to construction printing.

Océ Repro Desk Professional wages technology jujitsu on behalf of AEC, by leveraging disruptive forces to create new, more effective workflows for print creation, print-production management, and print distribution. It is a thoughtful, seamless, and full-service approach to IT for construction printing; it is a win-win for all involved. We see no competitive solution from any other source that does a better job of automating and integrating all aspects of the construction print workflow.

The only potential downside to this solution comes not from the reprographic side, but from the aspect of the rest of the AEC team. Placing the reprographics firm in the role of a key enabler of the process moves it from a relatively peripheral role to the center of the team's IT strategy. Not all team members may be delighted with this change. However, it is Cyon Research's opinion that the benefits of this change far outweigh any challenges that might arise from positioning the reprographer as a critical team member.

About Cyon Research…

Cyon Research is a consulting firm that provides design, engineering, construction, and manufacturing firms with a strategic outlook on the software tools and processes they rely on to create the world around us. Cyon Research also supports the vendor community with its unbiased insight, vision, and expertise to help them understand the complex nature of their markets and grow, by serving the needs of their customer base.

Cyon Research brings to its clients a unique combination of experience, perspective, and insight, supported by an extensive network of well-established industry relationships. Our close contacts throughout the user, analyst, vendor, and developer communities provide surprising benefits for our clients and add significant value to our services.

Those relationships are enhanced by our publications and events. While consulting is the heart of our activities, our publications and websites—including *CADCAMNet*, *Engineering Automation Report*, and *CADwire.net*—are our voice. Through them, we connect daily and monthly with the user and vendor communities. And COFES: The Congress on the Future of Engineering Software, our annual, invitation-only event, is our face—the place where we can make the types of connections that just aren't possible through any other means than face-to-face.

The focus of our research within the realm of design, engineering, construction, and manufacturing is technologies and markets that are likely to become real within the next two to six years.

The domain of our research is the tools, processes, and procedures used in the design, engineering, management, and production of the built environment and manufactured goods.

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