TRENDS & APPLICATIONS

Going (unintentionally) green

The unexpected bonus of switching to CAD/CAM and same-day dentistry

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With dentistry as innovative and dynamic as it is, the progress made and the exciting new trends that result are often judged by tests of the technological or financial. We can update our equipment to have a purely digital office, or we can adopt new practices and offer new procedures to our patients that bring in extra revenue.

While these accomplishments are certainly laudable, it is time for dentistry to measure its progress by different standards, ones that affect the profession and the world as a whole.

Fortunately, dental professionals no longer have to choose between advances in technology and what is considered “eco-friendly.” In fact, practice owners can assure themselves of the best of both worlds by adopting digital technology, such as in-office CAD/CAM systems such as the Planmeca PlanScan System (E4D Technologies). While the practical and financial benefits of CAD/CAM technology are well established, the environmental benefits—though discussed less often and perhaps not as well understood—abound.

CAD/CAM: Why dive into digital?

Though not ubiquitous, digital technologies, particularly in-office CAD/CAM systems, are making their presence known. Dental professionals who integrate these advanced technologies can offer same-day dentistry to their patients, that is, they condense the restorative process of multiple appointments over several weeks down to one appointment lasting a few short hours. Clinicians can digitally scan the patient’s teeth and design the restoration(s) right then and there. Once designed, the restorations can be immediately milled in the office and tried in the patient’s mouth, so a perfect fit and high-quality aesthetics are affirmed at the same appointment.

Digital practice equal green practices

Since CAD/CAM technology was first introduced decades ago, early adopters and technology enthusiasts have encouraged integration of these systems for various practical and aesthetic benefits. Through the integration of CAD/CAM, restorations mean that dental practices no longer have to wait for a perfect laboratory restoration.

Clinicians, too, reap several benefits. Digital scans equal easier “impressions” that enable accurate restorations of patients’ dentitions. Restorations can be designed in the office without communication or transfer to a dental laboratory, eliminating back-and-forth exchanges that cause delays or less than optimal results. In fact, restorations can now be fabricated with more patient input, since intuitive CAD software enables dentists to easily design restorations on-screen while remaining chairside, providing patients with that “wow” factor as they see what digital technology is all about. Once designed, the restorations can be immediately milled, assembled and tried in the patient’s mouth, so a perfect fit and high-quality aesthetics are affirmed at the same appointment.

By using digital technology, clinicians find that streamlined procedures and happier patients lead to significant return on investment.

But switching to a CAD/CAM system provides an unanticipated bonus, one with a far broader impact. Using an in-office CAD/CAM system is one of the most environmentally conscious upgrades a practice can make, offering both concrete and intangible benefits for dental practices, their patients and the greater community.

CAD/CAM systems add to a practice’s green image with the many small changes they allow the office to implement. For example, now that impressions are taken with a digital scanner (PlanScan), traditional impressions—and all their associated materials, such as disposable impression trays, impression material and the water with which it is mixed—are no longer necessary. Clinicians who thought they were only saving money (and storage space) can rest easy at night knowing they’re no longer contributing to the toxic waste that perfect laboratory restoration.

In addition to the above in-office water issues, along with laboratories and the respective procedures that will always require water, these staggering statistics spell out the clear need for water conservation whenever possible, and in-office CAD/CAM supports this effort.

An average dental practice uses 364 gallons of water per day. Think how much you can save by getting rid of extra water usage.

Greener materials: Using all ceramics instead of amalgam

Amalgam restorations had been the standard of care in restorative dentistry for decades. With material science advancements, however, there are new contenders for that title. In particular, the use of all-ceramic materials has significantly increased in recent years, and when coupled with in-office CAD/CAM systems, their advantages are economical and ecological, in addition to aesthetic, biocompatible and functional.

The majority of the materials for same day CAD/CAM dental procedures are generally composite or all-ceramic blocks, whereas metal-invol- involved. These metal-free restorations can be used without reservation for various indications, including single-unit restorations, inlays and onlays. While the benefits of these materials have been well documented (e.g., aesthetics, ease of use, wear, optical properties), they provide tangible environmental benefits as well.

For example, the longevity of all-ceramic restorations such as in-office CAD/CAM designed inlays is well documented. In addition to a high aesthetic restoration, patients receive restorations that will last for many years, without the concerns associated with amalgam, such as cracks, failures or potential mercury toxicity. This potentially saves patients and clinicians time, money and wasted resources that would be spent traveling to and from the dental practice, taking more impressions and fabricating new restorations.

Perhaps of greater consequence is removing toxic metal from this equation. All-ceramic and metal-free restorations mean that dental prac- tices no longer have to worry about amalgam disposal and its accompanying mercury toxicity.

The Environmental Protection Agency (EPA) estimates that nearly 50 per cent of all mercury entering local wastewater treatment facilities originates in dental offices.

Using CAD/CAM compatible materials such as all-ceramics lessens or eliminates the contribution of your dental office to environmental mercury. It also means that dental practices needn’t worry about using an amalgam separator.
Currently, the American Dental Association (ADA) does not have national regulations in place for amalgam separators, so many dental practices and laboratories aren’t compelled to use them.

Although designing and milling all-ceramic materials still requires energy and results in some waste materials, can they really compare with the toxic by-products of metal-based restorations?

Crunching the numbers:
CAD/CAM math

In-office CAD/CAM systems provide more than just a clear conscience about saving the environment. There are real, tangible benefits and savings that can easily be estimated to demonstrate the immense value of this digital technology.

Because same-day in-office CAD/CAM dentistry reduces the number of appointments from two (or possibly more, if the restoration does not fit) to one, it stands to reason that every dentist who incorporates these procedures would positively impact the environment by reducing the number of automobile trips patients make to the practice. This would result in a 50 per cent reduction in gasoline and oil product use.

With a carbon content of 2,421 grams, one gallon of gasoline produces approximately 19.4 pounds per gallon of carbon dioxide emissions. This is calculated by multiplying the carbon content (2,241) by the amount of carbon that remains unoxidized (0.99) by the ratio of the molecular weight of CO2 (44) to the molecular weight of carbon (12).

Using the state of California as an example, if we extrapolate to the United States as a whole, we can calculate that this would equal 400 million gallons of gasoline saved and 7,760 million pounds of carbon dioxide emissions eliminated per year (assuming the previously calculated 19.4 pounds per gallon measurement).

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While same-day dental procedures may not save the world, their potential impact, even estimated, is undeniable.

Conclusion

In-office CAD/CAM systems’ advantages are limitless. In addition to the clear financial and practical benefits they bring, their positive impact on the environment makes the decision to upgrade even better. They remove toxic, wasteful and disposable materials and practices from the equation, replacing them with greener practices that have a tangible influence. While the clinical advantages of CAD/CAM systems and same-day dentistry continue to be rightfully celebrated, their ecological advantages should not be overlooked.

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References