restorations are no longer necessary, pressions that make patients gag and are prone to errors. Temporary restorative dentistry is practiced. For one restoration become non-

technology find that streamlined procedures and happier patients lead to a significant return on investment. But switching to a CAD/CAM system provides an unanticipated bo-

s, one with a far broader impact. Using an in-office CAD/CAM system is one of the most environmentally con-

sures upgrades a practice can make, offering both concrete and intangible benefits for dental practices, their pa-

ients and the greater community. CAD/CAM systems add to a prac-

tions 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 im-

pressions—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 methods adds up. Using digital tech-

ology not only streamlines the process but ensures that materials, time and money aren’t wasted. Moreover, because traditional im-

pressions aren’t needed with a digi-

tal workflow, equipment previously used to perform these procedures, such as a mixing gun for impression material, are no longer necessary. While clinicians may think they are only saving them-

selves hassle or time by pur-

chasing an easier-to-use piece of equipment, they’re also saving energy—literally. With digital technology, impres-

sion-taking instruments no longer need to be run through a daily cycle and sterilized. This saves time, energy and water.

While it seems like saving resources, particularly water, isn’t possible in dental prac-

ices, small steps such as these really add up. The Eco-

Dentistry Association (EDA) (www.eco-dentistry.org) esti-

mated that dental practices use 360 gallons of water per day. This totals 20,000 gallons of water per year, per practice. In the United States alone, dental practice water usage totals ap-

proximately 9 billion gallons of water per year. This does not even include dental laborato-

ries, which consume substantial amounts of water when mixing and pouring models in stone and cleaning their equipment. In addition to the above out-office water issues, along with laboratories and their 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.

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, bio-compatible and functional.

The majority of the materials for same day CAD/CAM dental proce-

dures are generally composite or all-

ceramic blocks, so there's no metal in-

dolved. These metal-free restorations can often be used without reservation for various indications, including single-unit restorations, inlays and onlays. While the benefits of these materials have been underscored (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-

ly aesthetic restoration, patients re-

ceive restorations that will last for many years, without the concerns associated with amalgam, such as cracks, failures or potential mercury toxicity. This potentially saves pa-

tients and clinicians time, money and wasted resources that would be spent traveling to and from the den-

tal 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-

ices no longer have to worry about amalgam disposal and its accompa-

nying mercury toxicity. The Environmental Protection Agency (EPA) estimates that nearly 50 per cent of all mercury entering the environment originates in dental offices. Using CAD/CAM compatible ma-

terials such as all-ceramics lessen 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.

Going (unintentionally) green

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

By Dr Joel Strom, USA

With dentistry as innovative and dy-

namic as it is, the progress made and the exciting new trends that result are often judged by the rate of the tech-

nical 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 pa-

tients that bring in extra revenue.

While these accomplishments are certainly laudable, it is time for den-

tistry to measure its progress by dif-

ferent standards, ones that affect the profession and the world as a whole. In short, we can examine how our practices and procedures influence the environment and what dentistry as a profession can do to ensure this influence remains positive.

Fortunately, dental professionals no longer have to choose between advances in technology and what is considered “eco-friendly.” In fact, practice owners can assume them-

selves 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 fi-

nancial benefits of CAD/CAM technology are well estab-

lished, the environmental benefits—though discussed less often and perhaps not as well understood—abound.

CAD/CAM: Why dive into digital?

Thought not ubiquitous, dig-

ital technologies, particularly in-office CAD/CAM systems, are making their presence known. Dental profession-

als who integrate these ad-

vanced technologies can offer same-day dentistry to their patients, that is, they can conduct the restorative process of multiple appointments over several weeks down to one appointment lasting a few short hours. Clinicians can dig-

itally scan the patient’s teeth and design the restoration(s) right then and there. Once ap-

proved, 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 practice

Since CAD/CAM technology was first introduced decades ago, early adopters and technology enthusi-

asts have encouraged integration of these systems for various practical and ecological reasons. Though gener-

ally a substantial initial investment, practices that upgrade to digital technology find that streamlined procedures and happier patients lead to a significant return on investment.

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, bio-compatible and functional.

The majority of the materials for same day CAD/CAM dental proce-

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terials such as all-ceramics lessen 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.

Switching to digital systems is beneficial not only to clinicians and patients but to the environment as well. An average dental practice uses 360 gallons of water per day. Think how much you can save by getting rid of extra water usage.

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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 (2.421) 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, where approximately 10 per cent of the 100 million laboratory dental restorations are completed in the United States every year, we can calculate an approximate savings. If four gallons of gasoline are used for a round trip to the dentist, a restoration needing two appointments to complete would require eight gallons of gasoline. But if these dental practices adopted same-day in-office CAD/CAM dentistry, that number could be cut in half, saving four gallons of gasoline per restoration. Four gallons of gasoline multiplied by 10 million restorations would equal a savings of 40 million gallons of gasoline for restorative procedures in the state of California alone.

This, in turn, would equal a reduction of carbon dioxide emissions by 776 million pounds per gallon each year (assuming the previously calculated 19.4 pounds per gallon measurement).

If we extrapolate to the United States as a whole, we can calculate that this would equal 400 million gallons of gasoline saved and 7760 million pounds per gallon of carbon dioxide emissions eliminated, per year. This would all be due solely to reduction in patient automobile trips to and from the dentist for restorative procedures.

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