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OXY-FUEL CUTTING - AUTOMATION MAKES THE DIFFERENCE
GASNO REZANJE- AUTOMATIZACIJA ČINI RAZLIKU

Stručni rad / Professional paper

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Abstract

Like laser and water jet cutting, plasma cutting is today a highly automated process.

However, the situation is different when it comes to Oxy-Fuel cutting. Over the past few years it has become seemingly less attractive than the other cutting processes and there is a general reluctance to use it. Could the reason for this be perhaps, that the process is generally far less likely to be automated?

Each cutting method has the application for which it is best suited. Whereas laser is best for thin sheets, water jet is best for special materials where you need to avoid adding heat and plasma cutting is very good with stainless steel and for small contours. Oxy-Fuel is best suited for cutting carbon steel plate thicker than about 20mm and for cutting many identical parts.

The automation of plasma cutting systems has grown enormously over the last 10 years, mainly due to the innovative approach of the manufacturers of the plasma cutting systems.

Oxy-Fuel cutting is by far the oldest cutting method; everyone knows this. However, a lot of training is needed before you can become an Oxy-Fuel cutting expert and much experience gained over time is necessary to make the perfect cut every time. Oxy-Fuel cutting is in fact perhaps the most sophisticated cutting process.

The question is how can this knowledge be integrated into an automated system? Because automating the cutting process is surely the key to restore the attractiveness of Oxy-Fuel cutting. Personnel costs will be significantly reduced by adding automation and it will at the same time, increase production quality and safety. All these things have a major impact on overall productivity of the Oxy-Fuel cutting process.

Rezime

Kao i lasersko i vodeno rezanje, rezanje plazmom je danas visoko automatizovan process.

Međutim, situacija je drugačija kada se radi o gasnom rezanju. Tokom proteklih nekoliko godina ono je postalo naizgled manje atraktivno od ostalih procesa rezanja i postoji opšta nevoljnost da se ono koristi. Da li je možda razlog za to možda da je proces uopšteno daleko manje automatizovan?

Svaka metoda rezanja ima primenu za koju je najprikladnija. Dok je laser najbolji za tanke limove, vodeni mlaz je najbolji za specijalne materijale, gde treba izbegavati dodavanje toplote a rezanje plazmom je veoma dobro za nerđajuće čelike i za male konture. Gasno je najpogodnije za rezanje ploča od ugljeničnog čelika deblje od oko 20mm i za sečenje mnogih identičnih delova

Automatizacija sistema za rezanje plazmom je ogromno porasla u poslednjih 10 godina, uglavnom zahvaljujući inovativnom pristupu proizvođača sistema za rezanje plazmom

Rezanje kiseonikom je daleko najstariji metod rezanja; svi to znaju. Međutim, potrebno je mnogo treninga pre nego što postanete stručnjak za gasno rezanje i potrebno je mnogo iskustva stečenog tokom vremena da bi svaki put napravili savršen rez. Rezanje kiseonikom je možda najsofisticiraniji proces rezanja.

Pitanje je kako se to znanje može integrisati u automatski sistem? Zato što je automatizacija procesa rezanja svakako ključ za vraćanje atraktivnosti gasnog rezanja. Troškovi osoblja biće značajno smanjeni dodavanjem automatizacije i istovremeno će povećati kvalitet i sigurnost proizvodnje. Sve ove stvari imaju veliki uticaj na ukupnu produktivnost procesa gasnog rezanja.

1. Cutting Processes

When asked what are the differences between the four cutting processes used in sheet metal processing, answers often include cutting speed, the amount of manual rework that might be needed or sheet thickness. These are all correct and equally important. However, the most important difference is in how much of the cutting process has been automated. Looking at the four main steel cutting processes (laser, plasma, Oxy-Fuel and water jet), it is noticeable that the degree of automation differs considerably between the different processes. The laser process for example is highly automated, especially if the system has been supplied by one of the major manufacturers of such systems. This is because these companies have control of the entire process in their own hands.So, why is the plasma process so well automated? Basically, because it has to be, the generation of a stable plasma beam requires a lot of knowledge. This has led to the establishment of some renowned successful plasma cutting equipment suppliers who thrive on the innovating the plasma process. Water jet cutting, which has a high degree of automation, has its own special niche role in cutting steel, which will not be covered here. Now to the fourth cutting process, the Cinderella of the group. Oxy-Fuel cutting is already one hundred and fifty years old and many claim it is impossible to automate. It is the most complex process of all, but least automated. Why is this? Perhaps because Oxy-Fuel cutting is a mature, apparently simple technique, there are very few companies championing its cause? Some machine builders have attempted to automate the Oxy-Fuel cutting process but in most cases, the real cutting knowledge still lies with the system operator, i.e. the user. Another factor is the belief that as it is a supposedly simple process there is no training required for the cutting machine operator. But these experienced operators are retiring and the knowledge is being lost. There is still hope however because companies like GCE and IHT are investing heavily in the future of the Oxy-Fuel cutting process. There are other factors to consider, let's take the cutting cost per metre per cutting torch as an example (see Figure 1). Laser is unbeatable when cutting thin sheets. You get high-speed cutting, burr-free parts and low cutting costs. Plasma is unbeatable for sheet thicknesses from 15 to 35 mm, this is mainly due to the relatively high cutting speeds that can be achieved. Another advantage of plasma is the ability to cut different materials such as stainless steel or aluminium. The diagram in Figure 1 show that the investment cost not really a significant factor for the cutting costs.

1. Postupci rezanja

Na pitanje koje su razlike između četiri procesa rezanja koji se koriste u obradi lima, odgovori često uključuju brzinu rezanja, količinu ručne obrade koja bi mogla biti potrebna ili debljinu lima. Sve su one tačne i jednako važne. Međutim, najvažnija razlika je u tome koliko je proces rezanja bio automatizovan.

Gledajući četiri glavna procesa rezanja čelika (laser, plazma, gasno i vodeni mlaz), primetno je da se stepen automatizacije značajno razlikuje između različitih procesa.

Laserski proces je, na primer, visoko automatizovan, posebno ako je sistem isporučen od strane jednog od glavnih proizvođača takvih sistema. To je zato što ove kompanije imaju kontrolu nad celim procesom u svojim rukama.

Dakle, zašto je proces plazme tako dobro automatizovan? U osnovi, zato što stvaranje stabilnog plazma luka zahteva mnogo znanja. To je dovelo do osnivanja nekih poznatih dobavljača opreme za plazma rezanje koji napreduju u inoviranju plazma procesa.

Rezanje vodenim mlazom, koje ima visok stepen automatizacije, ima svoju posebnu ulogu u rezanju čelika, koje ovde neće biti obuhvaćeno.

Sada je četvrti proces rezanja, Pepeljuga grupe. Rezanje kiseonikom je prisutno već stotinu i pedeset godina i mnogi tvrde da ga je nemoguće automatizovati. To je najsloženiji proces od svih, ali najmanje automatizovan. Zašto je ovo? Možda zato što je gasno rezanje razvijena naizgled jednostavna tehnika, postoji vrlo malo kompanija koje zagovaraju njen cilj? Neki proizvođači mašina pokušali su da automatizuju proces gasnog rezanja ali u većini slučajeva, stvarno znanje o rezanju i dalje leži na operatoru sistema, tj. korisniku. Drugi faktor je verovanje da, pošto je to navodno jednostavan proces, ne postoji nikakva obuka za operatera mašine za sečenje. Ali ovi iskusni operateri se povlače i znanje se gubi. Ipak, postoji nada, jer kompanije kao što su GCE i IHT mnogo ulažu u budućnost procesa gasnog rezanja.

Postoje i drugi faktori koje treba uzeti u obzir, uzmimo na primer troškove rezanja po metru po plameniku za rezanje (rezaču) (vidi sliku 1). Laser je nepobediv prilikom rezanja tankih listova. Dobijate velike brzine rezanja, delove bez grubih ivica i niske troškove rezanja.

Plazma je nenadmašna za debljine ploča od 15 do 35 mm, uglavnom zbog relativno visokih brzina rezanja koje se mogu postići. Još jedna prednost plazme je sposobnost rezanja različitih materijala kao što su nerđajući čelik ili aluminijum. Dijagram na slici 1 pokazuje da investicioni troškovi zapravo nisu značajan faktor za smanjenje troškova. Na is

For example, laser has high investment costs, but the decisive factor is the cutting speed for very thin sheets.

primer, laser ima visoke investicione troškove, ali odlučujući faktor je brzina rezanja za vrlo tanke listove.

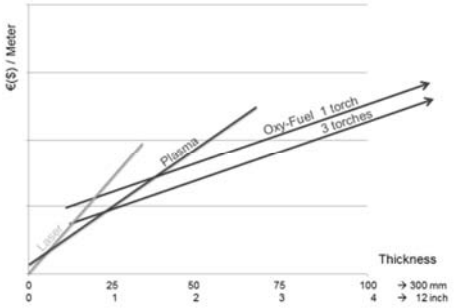

Figure 1 *Cost per meter per torch*
Slika 1. *Troškovi po metru i po "rezaču*

So, what is here the situation when it comes to Oxy-Fuel? The Oxy-Fuel cutting process is perceived as being a slow one. Yes, that is right, but as the sheets gets thicker this disadvantage suddenly disappears, because the other processes will also cut at a lower speed. The biggest advantage of Oxy-Fuel is its low energy cost. The other processes also need gases, but Oxy-Fuel does not need as anywhere as near as much electricity! The profitability curves show that it is the most economical process for plate thicknesses of approx. 30 mm or greater. When more than one cutting torch is used, the economy increases dramatically. Of course, these figures only apply to carbon steel, but as that makes up more than 90% of the volume of steel cut, Oxy-Fuel becomes a very interesting process. As I have said, each cutting process has technical and economic advantages and disadvantages. If you look closely, Oxy-Fuel cutting has more advantages than is reflected in its current market position. Let me go into more detail on the automation of plasma and Oxy-Fuel cutting.

Dakle, kakva je situacija kada je u pitanju gasno? Proces gasnog rezanja se smatra sporim. Da, to je tačno, ali kako listovi postaju deblji, ovaj nedostatak iznenada nestaje, jer će i drugi procesi smanjiti brzinu

Najveća prednost gasnog rezanja je niska cena energije. Drugim procesima su takođe potrebni gasovi, ali gasnom rezanju ne treba električna energija! Krive profitabilnosti pokazuju da je to najekonomičniji proces za debljine ploča od cca. 30 mm ili više. Kada se koristi više od jednog rezača, ekonomičnost se dramatično povećava.

Naravno, ove cifre se odnose samo na ugljenični čelik, ali pošto to čini više od 90% obima čelika, gasno rezanje postaje veoma zanimljiv proces. Kao što sam rekao, svaki proces rezanja ima tehničke i ekonomske prednosti i nedostatke. Ako bolje pogledate, gasno rezanje ima više prednosti nego što se odražava u trenutnoj tržišnoj poziciji.

Dozvolite mi da pređemo na više detalja o automatizaciji rezanja plazmom i gasno.

Automation of the Plasma process

Most important for a good plasma cut is the stabilisation of the plasma beam. Plasma manufacturers invest a great deal in developing innovative cutting torches and the control and regulation of gases. This automation is becoming increasingly complex to cover all materials and all possible cutting geometries, for example to cutting actual holes or preparing sheets for welding. The cutting speed and the distance between the torch and the work piece are important factors and should not be underestimated. These requires close communication between the plasma cutting system, the height control and the machine control. The interconnection of these three sub-systems is a great challenge. Here is an example (see Figure 2) that shows the changes in cutting speed for producing a circular hole. Does it have to be so complicated to cut a simple round hole?

Automatizacija plazma postupka

Za dobro rezanje plazmom, najvažnija je stabilizacija snopa plazme. Proizvođači plazme mnogo ulažu u razvoj inovativnih plamenika za rezanje i kontrolu i regulaciju gasova. Ova automatizacija postaje sve kompleksnija za pokrivanje svih materijala i svih mogućih geometrija sečenja, na primer za rezanje stvarnih rupa ili za pripremu limova za zavarivanje. Brzina rezanja i udaljenost između gorionika i radnog komada su važni faktori i ne treba ih podcenjivati. Ovo zahteva blisku komunikaciju između sistema za rezanje plazmom, kontrole visine i kontrole mašine. Povezivanje ova tri podsistema je veliki izazov. Evo primera (vidi sliku 2) koji pokazuje promene brzine rezanja za proizvodnju kružnog otvora. Da li mora biti tako komplikovano da se izreže jednostavna okrugla rupa?

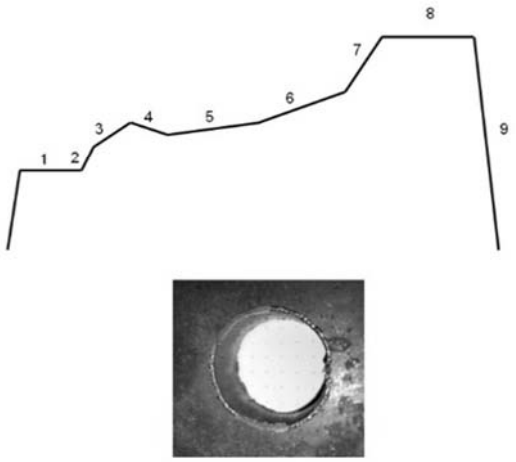

Figure 2 *Sequence Plasma hole cut*
Slika 2. *Rezanje otvora plazmom*

To obtain a good, reproducible cut, that is independent of the skill and current disposition of the machine operator, the cutting database comes into play. These databases have been developed and now made available by the manufacturers of the plasma systems. The essential parameters of plasma automation are included (cutting torch, height control and cutting database). Plasma manufacturers now have a good understanding of the plasma process, which can now be run fully automatically from sheet detection to ignition, hole piercing, cutting and ultimately achieving the results required.

2. Automation of Oxy-Fuel

When we look at the Oxy-Fuel process, the adoption of automation does not yet look so advanced. The process flow is similar to the plasma process. The difference is in preheating. While the heat input during plasma cutting comes from the plasma arc, when cutting with Oxy-Fuel, preheating depends on the fuel gas/oxygen mixture. In plasma cutting, the current that generates the plasma beam is easy to control. In Oxy-Fuel cutting, the flame is crucial and the quality of the flame depends on many factors, such as the type and quality of the gas, the cutting torch, control valves, safety equipment and so on.

As shown in Figure 3 (Thermal Balance), in the Oxy-Fuel cutting process, 20% of the energy for the cut comes from the heating flame (see the heating flame formula) and 80 % from the exothermic reaction of the iron with the cutting oxygen (see the combustion energy formula). The steel plate provided its own energy, there is no external power source required.

Formula for Combustion Energy

$$\mathbf{3Fe + 2O_2 \rightarrow Fe_3O_4}$$

Formula for Flame Energy

$$\mathbf{C_2H_2 + O_2 \rightarrow CO_2 + H_2O}$$

Da bi se dobio dobar, ponovljiv rez, koji je nezavisan od veštine i trenutnog rasporeda operatera mašine, baza podataka za rezanje, ulazi u igru. Ove baze podataka su razvijene i sada su dostupne od strane proizvođača plazma sistema. Uključeni su osnovni parametri automatizacije plazme (rezni gorionik, kontrola visine i baza podataka za rezanje). Proizvođači plazme sada dobro poznaju proces plazme, koji može biti potpuno automatizovan od prepoznavanja lima do paljenja luka, probijanja rupa, rezanja i na kraju postizanja potrebnih rezultata.

2. Automatizacija gasnog rezanja

Kada pogledamo proces gasnog rezanja, usvajanje automatizacije još uvek nije toliko napredno. Tok procesa je sličan procesu plazme. Razlika je u predgrevanju. Dok unos toplote tokom rezanja plazmom dolazi iz plazma luka, pri gasnom rezanju, predgrevanje zavisi od mešavine gorivog gasa / kiseonika. Kod rezanja plazmom, struju koja generiše plazma snop je lako kontrolisati. Kod gasnog rezanja, plamen je presudan, a kvalitet plamena zavisi od mnogih faktora, kao što su vrsta i kvalitet gasa, gorionik za rezanje, kontrolni ventili, sigurnosna oprema i tako dalje.

Kao što je prikazano na slici 3 (termička ravnoteža), u procesu gasnog rezanja , 20% energije za rezanje dolazi iz plamena za zagrevanje (vidi formulu plamena za grejanje) i 80% od egzotermne reakcije železa sa kiseonikom za rezanje (vidi formulu energije sagorevanja). Čelična ploča je obezbedila sopstvenu energiju, nije potreban spoljašnji izvor napajanja.

Formula za energiju sagorevanja

$$\mathbf{3Fe + 2O_2 \rightarrow Fe_3O_4}$$

Formula za energiju plamena

$$\mathbf{C_2H_2 + O_2 \rightarrow CO_2 + H_2O}$$

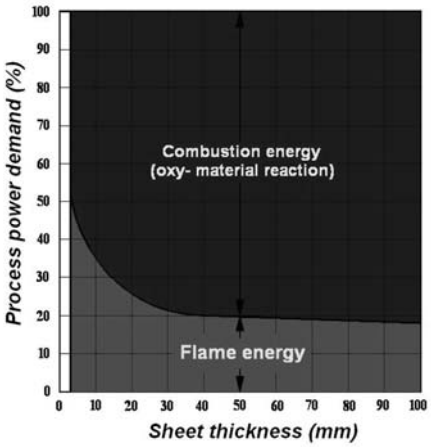

Figure 3 *Thermal Balance*
Slika 3. *Termički balans*

The Oxy-Fuel cutting flame actually heats up the plate more than either Laser or Plasma. These are the grey areas in Figure 4. On the left side, it is the heating flame (similar shape as the flame energy from Figure 3). The grey area at the right side is from the blow out of the slag. The middle part is from the burning of iron using cutting oxygen, the combustion energy.

Plamen za gasnorezanje zapravo zagreva ploču više nego laser ili plazma. Ovo su sive oblasti na slici 4. Na levoj strani, to je plamen za grejanje (sličan oblik energije plamena sa slike 3). Siva zona na desnoj strani je od izbacivanja šljake. Srednji deo je od sagorevanja železa pomoću rezanja kiseonikom, energijom sagorevanja.

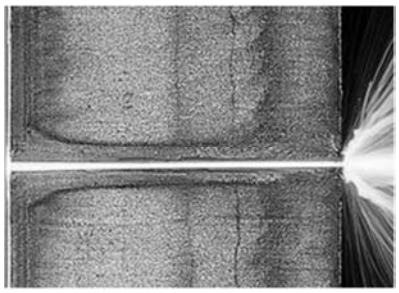

Figure 4 *Heat Affected Zone*
Slika 4. *Zona uticaja toplote*

The zone actually affected by heat is larger when cutting with Oxy- Fuel. However, the surface is hardened less because the part takes longer to cool and therefore parts cut with Oxy-Fuel are easier to weld than parts cut using plasma. The second point is the safe ignition of the flame. Manual ignition is still widespread with Oxy-Fuel systems and I think it is important to read the EU Machinery Directive here. It states that machines require safe protection against accidental contact during operation. In other words, it can be seen that automatic ignition, especially not using other external equipment, conforms more closely to the Directive. Reliable automatic ignition also increases productivity and saves costs. Third, the preheating process. The sheet needs to reach a certain temperature to start the hole piercing process. Here the question that always arises is “When is this point reached? How can this be automated?” Many people just trust the machine operator and rely on him to be paying full attention. This is a negative point when compared to plasma and laser,

Zona koja je pod uticajem toplote je veća kada se gasno reže. Međutim, površina manje otvrdnjava jer se deo duže hladi i stoga se delovi koji se gasno režu, lakše zavaraju nego delovi koji se režu plazmom. Druga tačka je bezbedno paljenje plamena. Ručno paljenje je još uvijek široko rasprostranjeno kod gasnog sistema i mislim da je ovde važno pročitati EU Direktivu o mašinstu. Tu se navodi da mašine zahtevaju sigurnu zaštitu od slučajnog kontakta tokom rada. Drugim rečima, može se videti da se automatsko paljenje, pogotovo ako se ne koristi druga spoljna oprema, više uklapa u Direktivu. Pouzdano automatsko paljenje takođe povećava produktivnost i štedi troškove. Treće, proces predgrevanja. Lim mora da dostigne određenu temperaturu da bi počeo proces probijanja rupe. Ovde se uvek postavlja pitanje: “Kada je ta tačka dostignuta? Kako se ovo može automatizovati? “Mnogi ljudi jednostavno veruju operatoru mašine i oslanjaju se na to da on posvećuje punu pažnju. Ovo je negativna tačka u poređenju sa plazmom i laserom, gde se

where the preheating is achieved very quickly due to the high energy input and is therefore easier to handle. Modern systems have the preheating time included in their cutting database. Automatic detection is desirable but not yet available. The fourth point is the piercing process. This is where the biggest mistakes happen in the Oxy-Fuel process. Correctly automating the piercing process is one of the most important tasks that needs to be achieved in an automated system. Currently all the knowledge of piercing is still in the hands (or head) of the plant operator, so transferring this information into our automated system is vital before our trained operator retires. There are many parameters to consider; Gas quantity, torch height, speed, time, material to be cut, selection of cutting nozzles, sheet thickness, Only sophisticated cutting machines are able to offer a good solution to this tricky problem.

predgrevanje postiže veoma brzo zbog velikog unosa energije i stoga je lakše rukovati. Moderni sistemi imaju vreme predgrevanja u svojoj bazipodataka za sečenje. Automatska detekcija je poželjna ali još nije dostupna. Četvrta stvar je proces probijanja. Tu se najveće greške dešavaju u procesu gasnog rezanja- Pravilno automatizovanje procesa probijanja je jedan od najvažnijih zadataka koje treba postići u automatizovanom sistemu. Trenutno sve znanje o probijanju je još uvek u rukama (ili glavi) operatera postrojenja, tako da je prenošenje ovih informacija u naš automatizovani sistem od vitalnog značaja pre nego se naš trenirani operater povuče. Postoji mnogo parametara koje treba razmotriti; količina gasa, visina gorionika, brzina, vreme, materijal za sečenje, izbor mlaznica za sečenje, debljina lima, Samo sofisticirane mašine za sečenje mogu da ponude dobro rešenje za ovaj problem.

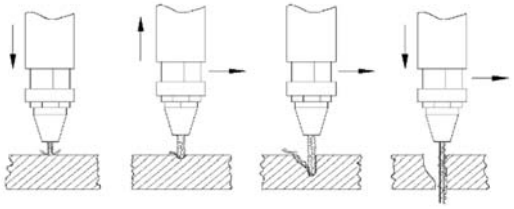

Figure 5 *Piercing process*
Slika 5. *Proces probijanja*

Often when cutting with acetylene, backfire occurs in the cutting torch. Backfire mean that the flame burns inside the torch and not outside. With a flame temperature of approx. 3,200 degrees Celsius, you can calculate how quickly the torch will be destroyed. The torch manufacturer is pleased and the user is annoyed. In IHT's APC system, this backfire is detected, the torch is moved to an upper position and the gas supply is immediately cut off thus preventing damage to the cutting torch. Sometimes when cutting there is a build-up of slag on the plate exactly where the cut is to be made. You know you can't get through that mountain of slag. Being an oxide the slag is as hard as glass and there is a risk the cut will fail. What you actually doing is to remove the slag by scratching it. This is at the expense of your productivity. It would be ideal if the torch was to be moved automatically away from the slag without making contact. This is now possible with modern systems such as the APC system. The system automatically detects the slag and sends a signal to the machine control system to reduce the cutting speed. Last but not least, there is the cutting database. This contains the data for all cuttable materials and for sheet thicknesses from 3 to 300mm along with all the information of the entire cutting process from ignition to preheating, hole piercing and cutting.

Često prilikom rezanja sa acetilenom dolazi do paljenja vatre u gorioniku. Povratno paljenje znači da plamen gori unutar baklje, a ne izvana. Sa temperaturom plamena od cca. 3.200 stepeni Celzijusa, možete izračunati koliko brzo će se uništiti baklja. Proizvođač gorionika je zadovoljan a korisnik je ljut. U IHT-ovom APC sistemu, ova povratna paljenja se detektuju, gorionik se pomera u gornji položaj i dovod gasa se odmah prekida, čime se sprečava oštećenje plamenika za rezanje. Ponekad prilikom rezanja na ploči se nakuplja šljaka tačno tamo gdje se vrši rez. Zna se da ne možeš proći kroz tu planinu šljake. Budući da je oksid, šljaka je čvrsta kao staklo i postoji rizik da će rez biti neuspešan.
Ono što radite je da uklonite šljaku tako što ćete je sastrugati. To je na štetu vaše produktivnosti. Bilo bi idealno da se gorionik automatski premesti iz šljake bez kontakta. To je sada moguće sa modernim sistemima kao što je APC sistem. Sistem automatski detektuje šljaku i šalje signal kontrolnom sistemu mašine da smanji brzinu rezanja.
Poslednje, ali ne i najmanje važno, postoji baza podataka o rezanju. Sadrži podatke za sve materijale koji se mogu rezati i za debljine ploča od 3 do 300 mm, zajedno sa svim informacijama o celom procesu rezanja od paljenja do

These and many other features can be incorporated into your cutting systems today so that Oxy-Fuel cutting can have the same level of technology as the other processes and that Oxy-Fuel cutting will return to its original status in our industry.

3. Industry 4.0

What is still missing in thermal cutting is its integration with "Industry 4.0" or, as the Americans say, the "Internet of Things" (IoT for short). There is still a lot of some catching up to do in the cutting industry. If each device can record what it has been used for and for how long and when it may require maintenance, you have already achieved a large part. For this, every device needs a certain level of built-in intelligence and a modern method of communication. The place to start with this is the cutting torch. This is the lowest level. The next is the evaluation at the machine level in order to evaluate, display and intelligently link to this information so that it can be used by others such as the machine manufacturers. With this real data, the experts can carry out the evaluations and then make suggestions to the user on how and when to have the machine serviced. However, remember that you can think of The Cloud as being “Someone else's PC", so before you copy your files to storage that belongs to someone you may not know that well, make sure that there a real benefit for you in doing so. Certainly, Industry 4.0 will come and it will come faster than we believe but do not forget that not everything that is possible is necessarily useful or even safe.

4. Conclusion

In summary, plasma cutting has already been highly automated by the plasma source manufacturers and many machine builders integrate these solutions into their cutting machines. This is currently not the case with Oxy-Fuel cutting. As older experienced Users retire, knowledge gained about Oxy-Fuel cutting over many years is being lost as it hasn’t been transferred to their younger replacements who sadly lack expertise and experience. Automation is the key for the future. There is still a lot to be done. This concerns both the automation of the process and the integration of automation into the cutting machine. There is a new momentum in automation of Oxy-Fuel cutting but only if Oxy-Fuel is perceived as important, will proper investment be made again, in technology and in training. The most important thing, however, is that you as the decision-maker first select the right cutting process for your application. Automation is not the only criteria, but it is as to say the least, a very important one.

predgrevanja, probijanja rupa i rezanja.

Ove i mnoge druge karakteristike mogu se danas ugraditi u vaše sisteme za sečenje tako da gasno rezanje može da ima isti nivo tehnologije kao i drugi procesi i da će se gasno rezanje vratiti u prvobitni status u našoj industriji

3. Industrija 4.0

Ono što još uvek nedostaje u termičkom rezanju je njegova integracija sa "Industrijom 4.0" ili, kako kažu Amerikanci, "Internet of Things" (IoT skraćeno). U industriji rezanja još ima dosta toga da se nadoknadi. Ako svaki uređaj može da zabeleži za šta je bio korišćen i koliko dugo i kada može da zahteva održavanje, već ste postigli veliki deo. Za to je, svakom uređaju potreban određeni nivo ugrađene inteligencije i moderan način komunikacije. Mesto za početak je gorionik za rezanje.

Ovo je najniži nivo. Sledeće je procena na nivou mašine da bi se procenila, prikazala i inteligentno povezala ova informacija, tako da je mogu koristiti drugi proizvođači mašina. Sa ovim stvarnim podacima, stručnjaci mogu izvršiti procene i zatim dati predloge korisniku o tome kako i kada servisirati mašinu. Međutim, zapamtite da se Cloud može smatrati „nečijim PC-jem“, tako da pre nego što kopirate fajlove u skladište koje pripada nekome, možda nećete znati da je dobro da se to desi. Naravno, Industrija 4.0 će doći i doći će brže nego što verujemo, ali ne zaboravite da nije sve što je moguće uvek korisno ili čak sigurno.

4. Zaključak

Ukratko, plazma rezanje je već bilo visoko automatizovano od strane proizvođača plazme i mnogi proizvođači mašina integrišu ova rešenja u svoje mašine za sečenje.

Ovo trenutno nije slučaj sa gasnim rezanjem. Kao što se stariji iskusni korisnici povlače, znanje stečeno o gasnom rezanju tokom mnogih godina se gubi jer nije preneto na njihove mlađe zamene koje nažalost nemaju stručnosti i iskustva. Automatizacija je ključ za budućnost. Ima još mnogo toga da se uradi. Ovo se odnosi i na automatizaciju procesa i integraciju automatizacije u mašinu za sečenje. Postoji novi zamah u automatizaciji rezanja kiseonika, ali samo ako se gasno rezanje sagleda kao važno, ponovo će se napraviti odgovarajuća investicija, u tehnologiji i obuci.Najvažnija stvar je, međutim, da vi kao donosilac odluka prvo izaberete pravi proces rezanja za vašu aplikaciju. Automatizacija nije jedini kriterijum, ali je najkraće rečeno, veoma važan.