

ACMA6000

ADVANCED PROCESSES & MATERIALS

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P. Bauer

Q1.

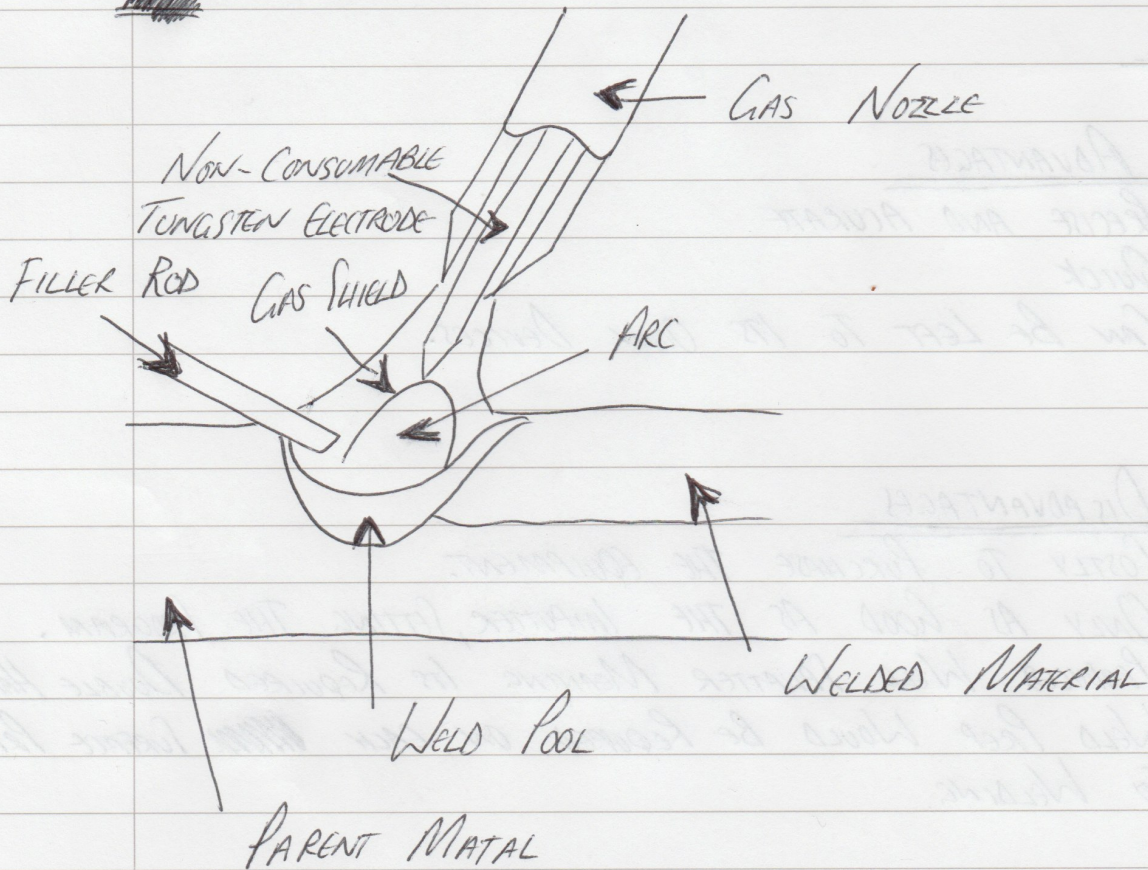
1A) ADVANTAGES

- PRECISE AND ACURATE
- QUICK
- CAN BE LEFT TO ITS OWN DEVICES.
-

DISADVANTAGES

- COSTLY TO PURCHASE THE EQUIPMENT.
- ONLY AS GOOD AS THE IMPUTTER, SETTING THE PROGRAM.
- PRODUCES WELD SPLATTER MEANING ITS REQUIRED DOUBLE HANDLING
- WELD PREP WOULD BE REQUIRED ON EACH ~~WELD~~ SURFACE PRIOR TO WELDING.

(B)



IN THE TUNGSTEN ARC GAS WELDING PROCESS ALSO KNOWN AS TIG. AN ARC IS STUCK BETWEEN A NON-CONSUMABLE TUNGSTEN ELECTRODE WHICH PROVIDES THE HEATING CAPACITY AND NECESSARY TEMPERATURE FOR WELDING. TUNGSTEN HAS A MELTING POINT OF 3422°C AND THIS MEANS THAT ~~IT IS~~ ^{IT IS} IDEAL AS A "NON-CONSUMABLE". THE WELD IS PROTECTED FROM THE ATMOSPHERE BY A STREAM OF INERT GAS WHICH SURROUNDS THE ARC. A FILLER CAN BE INTRODUCED MANUALLY, OR MORE RECENTLY, AUTOMATICALLY. THE GASES ARE CHOSEN ACCORDING TO THE METAL BEING WELDED. FOR EXAMPLE ALUMINIUM ALLOY USE A 95% ARGON AND 5% HYDROGEN MIX AND TITANIUM ALLOYS USE HELIUM, OR A HELIUM ARGON MIX. THIS PROCESS TENDS TO BE CLEAN MORE ACCURATE AND HAS MORE CONTROL AND PENETRATION THAN EITHER OXY-ACETYLENE OR MMA. A WIDE RANGE OF MATERIALS AND ALLOYS CAN BE WELDED AND IT IS ESPECIALLY USED FOR ROOT WELDS.

Q2.
2A)

 QUALITY THERMAL SPRAYING RELIES ON THREE MAIN FACTORS:

1. HEAT SOURCE
2. HEAT CAPACITY
3. PARTICLE VELOCITY.

HEAT SOURCE IS SEPARATED INTO 2 COLUMNS. COMBUSTION AND ELECTRICAL.

COMBUSTION CONTAINS - FLAME SPRAY, HVOF SPRAY AND DETONATION GUN SPRAY. WHERE AS ELECTRICAL CONTAINS - WIRE/ARC SPRAY AND PLASMA SPRAY.



~~Handwritten scribble~~

Q1
Q2

Quartzite Tectonic History

Factor:

1. Heat
2. Pressure
3. Particle Velocity

Heat Factor is Pressure (no 2 Column) (combustion and electrical)

Combustion (contains - Fine Particles) (heat and pressure) (can be used as electrical) (heat/pressure and pressure)

2B)

A

Q3.

3A)

Prior to recycling ~~materials~~ ^{MATERIALS}, THE MATERIALS WOULD FIRST BE REQUIRED TO BE SORTED INTO THEIR CLASSIFICATIONS. THESE ARE METALS, POLYMERS, CERAMICS, COMPOSITES AND NATURAL. THIS COULD BE DONE BY USING AN EDDY CURRENT SEPARATOR WHICH WOULD CARRY MATERIAL THROUGH ITS SELF ON A CONVEYOR BELT AND WOULD CREATE A MAGNETIC FIELD TO EJECT MAGNETIC MATERIALS OR MAGNETISE THEM, SO THAT THEY WOULD FALL INTO THEIR DESIRED CHUTE. THE NON METALLIC MATERIAL WOULD THEN PROCEED TO FALL INTO THE OTHER HOPPER WHERE IT WOULD COMMENCE WITH FLOWING THROUGH VARIOUS SORTING EQUIPMENT AND PERSONNELS UNTILL ALL THE MATERIALS WERE ORDERED INTO THEIR CLASSIFICATION.

THE MACHINERY TO ORGANISE THE MATERIALS CAN BE VERY EXPENSIVE TO PURCHASE, MAINTAIN AND SERVICE. OTHER FACTORS WOULD ALSO BE REQUIRED TO ACCOUNTED FOR IS THE ENVIRONMENT IN WHICH THE EQUIPMENT IS REQUIRED TO WORK IN. THERE WOULD ALSO BE A VERY HIGH SOUND POLLUTION CAUSED BY THE EQUIPMENT WHICH WILL EFFECT THE LOCAL ENVIRONMENT AND PERSONNELS LIVING AND WORKING CLOSE BY.

TRANSPORTATION WOULD NEED TO BE TAKEN INTO ACCOUNT ALSO AS VEHICLES WOULD BE REQUIRED TO TRANSPORT THEM TO THE RECYCLING PLANT OF THEIR CLASSIFICATIONS. SUCH AS COULD THEY BE TRANSPORTED BY SEA DIRECTLY OR TRANSPORTED VIA AIR DECREASING THE CARBON FOOTPRINT.

3B)

STAINLESS STEELS IN THEIR SOLID STATE HAVE A CRYSTALLINE STRUCTURE. AUSTENITIC AND FERRITIC STAINLESS STEEL REFER TO THEIR TYPE OF CRYSTALLINE STRUCTURE WHICH AFFECT THE PROPERTIES OF THE MATERIAL.

AUSTENITIC

AUSTENITIC HAS A HIGH MELTING TEMPERATURE ^{WHICH WILL} ~~AT A~~ RECRYSTALLISE INTO FERRITE AT APPROXIMATE 733°C , WHICH WILL MAKE IT BECOME THE MORE STABLE PHASE. SOME ALLOYS SUCH AS NICKEL, CAN STABILISE THE AUSTENITE PHASE DOWN TO ROOM TEMPERATURE. THE ALLOY ELEMENT ARE DIFFERENT BETWEEN 300 AND 400.

300 SERIES CONTAINS ENOUGH NICKEL TO STABILISE AUSTENITIC AT ROOM TEMP, THEREFORE HAVE A HIGHER CORROSION RESISTANCE. AUSTENITIC ~~ALL~~ STEEL IS TYPICALLY THE MOST USED METAL WITHIN INDUSTRY.

FERRITIC

THE SHAPE OF THE CRYSTAL STRUCTURE WITHIN FERRITIC MATERIALS ONLY ALLOW IT TO CONTAIN A NOMINAL AMOUNT OF CARBON WITHIN ITS STRUCTURE. THEREFORE MAKES THE MATERIAL SOFT, DUCTILE AND LIMITED CORROSION RESISTANCE WITH AVERAGE DURABILITY. NON-STAINLESS MATERIALS ARE CONSIDERED "FERRITIC" MATERIALS, BECAUSE AT ROOM TEMPERATURE THE MATERIAL HAS A MIXTURE OF FERRITE AND PEARLITE PROPERTIES. FERRITIC ~~ALL~~ STEELS ARE MAGNETIC AND THEREFORE ARE NOT RECOMMENDED FOR USE IN HIGH-TEMPERATURE SETTINGS.

MARTENSITIC

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E. Buller

MARTENSITE IS A META-STABLE PHASE FORMED WHEN HIGH-TEMPERATURE AUSTENSITE IS QUICKLY COOLED BELOW A CRITICAL TEMPERATURE. DURING THE COOLING ~~TIME~~ PROCESS, CARBON ATOMS ARE TRAPPED WITHIN THE CRYSTALLINE STRUCTURE. MARTENSITIC METALS HAVE HIGH STRENGTH, BUT LOW FRACTURE RESISTANCE ^{AND} DUCTILITY. TEMPERING CAN BE APPLIED TO MARTENSITIC STEEL, REDUCING THE STRENGTH BUT INCREASING TOUGHNESS AND DUCTILITY. MARTENSITIC METALS CAN BE MAGNETISED AND THEREFORE THIS MATERIAL IS USED AS COOKING UTENSILES SUCH AS KNIVES.

Q4

4A)

THE CLAIM THAT THE LIFECYCLE BASED CARBON ACCOUNTING OF THE CAR CAN BE SCRUTINISED, TUE TO THEM JUST REFERING TO THE CARS WORKING LIFE. THE COMPANY HAVE ONLY REFERENCED UNDER THE CUSTOMERS USE AND ^{NOT} ACTUALLY THE AMOUNT OF CARBON PRODUCED BY THE ~~COMPANY~~ COMPANY TO MANUFACTURE THE ACTUAL PART(S) FOR THE COMPLETED CAR. THIS ~~IS~~ ALSO APPLYS FOR THE END OF THE CAR, SUCH AS WHEN ^{THE CAR IS} REQUIRED TO BE SCRAPPED, HOW MUCH ~~THE~~ ENERGY IS REQUIRED IN ORDER TO CRUSH, RE-USE/MELT-DOWN ETC.

WHEN CLAIMING THESE STATES FOR THE CAR, THE COMPANY HAVE NOT GIVEN FACT OF THE FIGURES NEEDED TO BACK THEIR CLAIM. THEY HAVE ALSO NOT STATED IN WHO THEY ARE COMPAIRING TOO. SUCH AS CURRENT MODELS WITHIN WEIGHT, MATERIALS, TARGET AUDIENCE, COMPETITOR MODELS AND VARIOUS OTHER FACTORS NOT MENTIONED.

4B)

LIFE CYCLE : 250,000 KM (EACH)

TOYOTA WEIGHT : 800 KA

ALUMINIUM RANGE ROVER WEIGHT : 375 KA

CARS CONTAIN : 800 KA OF ALUMINUM

300 KA OF STEEL

50 KA OF COPPER

120 KA OF PLASTIC

CARBON FOOTPRINT FOR : SHEET STEEL = 1.2 KA/KA

ALUMINIUM = 14.5 KA/KA

COPPER = 9 KA/KA

PLASTICS = 1.5 KA/KA

4c) • TRANSPORT THE MATERIALS USING TRAINS AS THERE WOULD BE A DECREASE IN THE CARBON FOOT PRINT AND INCREASE THE QUANTITY OF PRODUCT MOVING TO THE REFINING COMPANY.

- PLANTS ^{AND TREES} MAY BE PLANTED IN LOCAL AREA DECREASING THE CARBON GOING TO THE ENVIRONMENT.
- HAVE ALL THE PRODUCTS BE CREATED UNDER ONE ROOF REDUCING THE OVERALL TRANSPORT TIME AND EMISSIONS.
- CAN THE SOME PROCESSES BE CARRIED OUT NATURALLY OR AT THE SAME TIME ANOTHER PROCESS IS BEING CARRIED OUT.