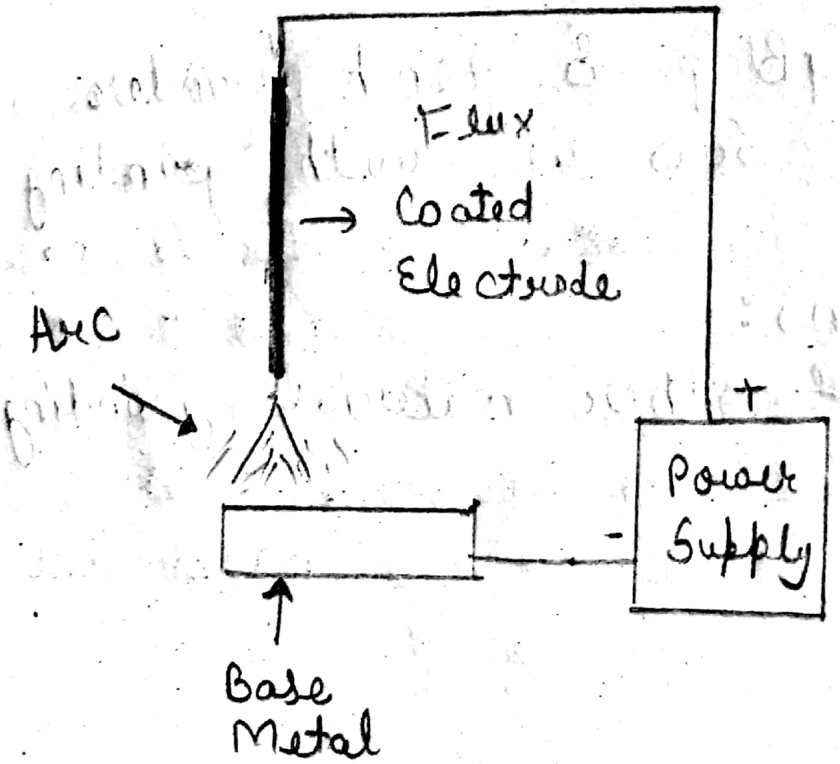


Circuit diagram for SMAW

8th Aug, 2017

Shielded Metal Arc Welding (SMAW)

1. Aim :- To get basic hand-on experience with various tools ~~in~~ used in SMAW process.

2. Apparatus required :- (i) Flux-coated electrode
(ii) Power Source
(iii) Hand-Shield
(iv) Clamp
(v) Electrode holder
(vi) Wire Brush
(vii) Base Metal (work piece)
(viii) Chipping Tool

3. Theory :-
On touching electrode with workpiece, circuit gets completed and there is e^- emission from surface of base metal. Due to air resistance & collision b/w e^- & air molecules (resulting in ionisation of air molecules)

plasma formation takes place, along with lots of heat generation. This Plasma is the reason of U.V. rays generation taking place.

Total Heat (H) = $\frac{1}{3}$ H (-ve terminal) + $\frac{2}{3}$ H (+ve terminal)

Due to heat generated, metal melts down & the flux from electrode gets added up, which on cooling forms slag. This slag has to be chipped out.

4. Procedure :-

(i) Complete the circuit by clamping one of the end (terminal) to the base metal.

(ii) Turn on Power Supply; touch electrode to the workpiece to initiate the arc.

(iii) On arc initiation, lift electrode up & maintain minimal possible distance b/w the two throughout the process.

(iv) Move electrode all over the weldable portion.

(v) Chip out the slag with chipping hammer once done with welding.

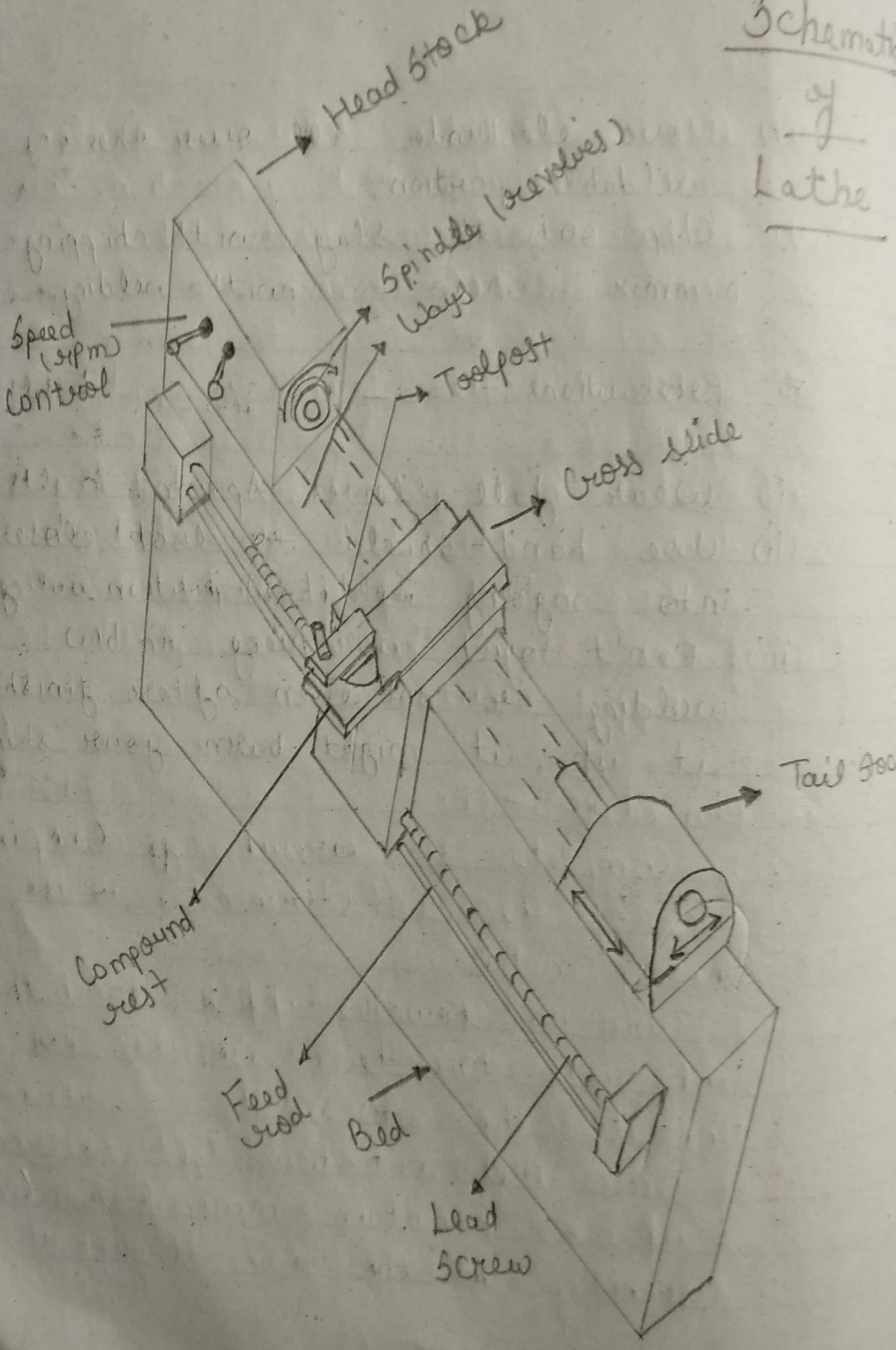
5. Precautions :-

(i) Wear full-sleeves Apron.

(ii) Use hand-shield to look closer into ongoing weld portion.

(iii) Don't touch workpiece in b/w welding or not even after finishing it up ; it might burn your skin.

Schematic of Lathe



22nd Aug, 2017 2.

Lathe Machine

1. Aim :-

To understand the various operations like surfacing, facing, knurling, step turning etc. on Lathe Machine with the help of Round bar.

2. Machine parts :- (i) Head stock & Tail stock
(ii) Bed
(iii) Carriage
(iv) Tool post
(v) Cross slide
(vi) Chuck (3-Jaw Chuck)
(vii) Lever
(viii) Single point cutting tool

3. Theory :-

The Lathe Machine holds workpiece b/w two rigid & strong supports called centres (or chuck)

The Cutting tool is rigidly held & supported in a tool post which is fed against revolving work.

Depending upon operations performed, position of Cutting tool changes as follows:

[Consider direction of movement of Cross slide as Main Axis] → Main Axis
i.e. ~~to~~ to principal Axis

(i) Facing :- ~~At~~ 30° to the main axis towards workpiece

(ii) Surfacing :- Along main Axis

(iii) Knurling :- Different knurling tool is used which is held along main axis

(iv) Champhering :- 45° to main axis away from workpiece

In drilling operation, tail stove acts as chuck to hold drill bit.

4. Procedure :-

(i) Hold the specimen into the chucke adjust the direction of cutting tool as per requirement of operation.
(ii) Move lever in such a way to help workpiece rotate about principal axis/that connects centres of tail stock & chuck in head - stock
(iii) Turn on the machine
(iv) Move cross slide longitudinally or transversally as per operational requirement.
(v) Use Vernier Calliper to measure various diameter, lengths or depths of the operated workpiece.

5. Observation :-

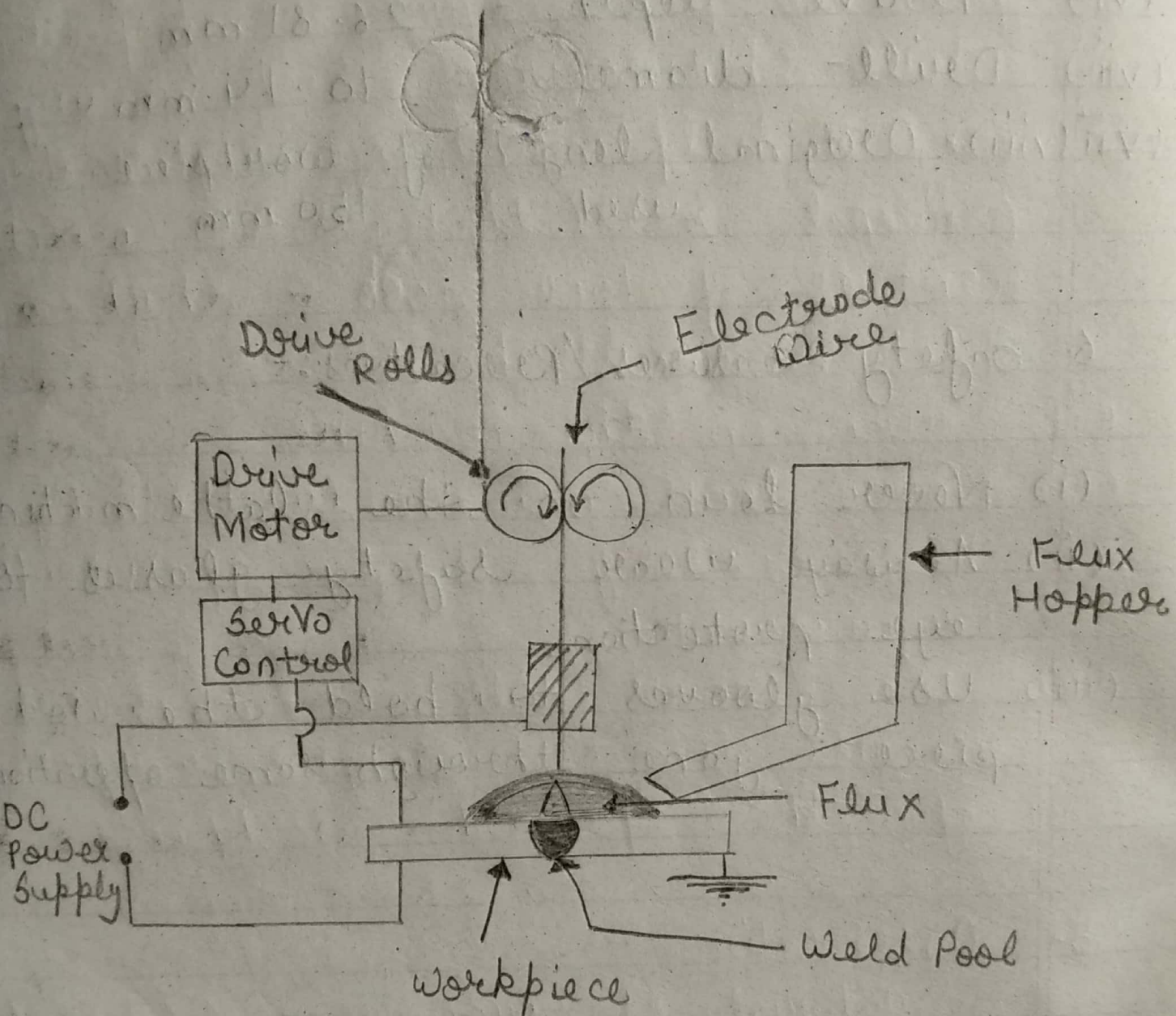
Material of Round bar → Mild Steel
Material used for Cutting tool → High speed steel

(i) Diameter of smaller step = 21.52 mm
(ii) Diameter of larger step = 31.54 mm
(iii) Length of smaller step = 49.17 mm

(iv) Length of largest step = 98.26 mm
(v) Knurling distance = 51.15 mm
(vi) Drill - depth = 26.81 mm
(vii) Drill - diameter = 10.14 mm
(viii) Original length of workpiece used = 150 mm

5. Safety Measures / Precautions :-

(i) Never lean on the lathe machine
(ii) Always wear safety glasses for eye protection.
(iii) Use gloves to hold the work-piece gone through some operation.



Schematic of SAW

29th Aug, 2017 3.

Submerged Arc Welding process (SMAW)

1. Aim :-

To understand the utility of SMAW process by understanding various process parameters.

2. Machine Tools (parts) :- (i) Flux & flux hopper
(ii) Electrode wire
(iii) Wire feed
(iv) Drive motor
(v) Controller
(vi) Power Supply
(vii) Chipping hammer

3. Theory :-

It is a semi-automatic process which can be conducted either automatically or manually. Arc is generated using consumable electrode under the blanket of fine-sized grains. This blanket protects us from spark or intense U.V. rays.

The granular flux contains lime, Silica, MnO_2, Calcium fluoride etc. which in molten state can make a conductive way for current to move.

4. Procedure:-

(i) Various process parameters are set in the control Panel.
(ii) Workpiece is set linearly along the motion of nozzel wire (linear) during welding.
(iii) Granulated flux is used as blanket to cover workpiece.
(iv) After application of power, welding is done over the length of the required portion of workpiece.
(v) At the end, slag is chipped out.

5. Observation:-

SAW process depends on some parameters list below:

(i) Wire feed rate (WFR)
(ii) Nozzle to plate distance (NPD)
(iii) Arc Voltage
(iv) Welding Speed

6. Precautions:-

(i) Do not touch the workpiece after welding. Use gloves instead.
(ii) Operate machine carefully with set procedure.

29th Aug, 17 4.

Consumption & Deposition Rates

1. Aim :-

To comparatively ~~as~~ evaluate the electrode consumption rate & metal deposition rate on plates in case of single as well as dual electrode consumables.

2. Apparatus required :-

(i) Consumable electrodes
(ii) Power Source
(iii) Weighing Machine
(iv) Chipping tool
(v) Hand Shield
(vi) Base metal plates
(vii) Electrode holder etc.

3. Observations :-

(a) For plate ① [Single Consumable]

(i) Original weight of plate = 1096.5 g

(ii) Weight of electrode used (4 electrodes) = 226

Weight of 1 electrode = $\frac{226}{4}$ = 56.5 g

(iii) Weight of unused electrode left at the end of process = 2.0 g

(iv) Welding time taken = 106 sec.

(v) Weight of plate after deposition = 1137 g

(b) For plate ② [Dual Consumable]

(i) Weight of plate initially = 1076 g

(ii) Weight of unused electrodes left = 30.5 g

(iii) Welding time taken = 110 sec.

(iv) Weight of plate after deposition = 1144 g

4. Calculation :-

(a) Electrode Consumption rate → (C.R.)

Plate 1 →

$C.R._1 = \frac{56.5 - 2}{106}$

$= 0.514$ g/sec.

$= 0.514 \times 3600$

$= 1.85$ kg/hour

Plate 2 →

$$\therefore C\text{-}R_2 = \frac{2 \times 56.5 - 30.5}{110} = 0.75 \text{ g/sec.}$$

$= 0.75 \times 3600$

$= 2700$ g/hour

$= 2.7$ kg/hour

$$\text{Relative Increase in Consumption Rate} = \frac{2.7 - 1.85}{1.85} \times 100$$

$= 46\%$

(b) ~~Decom~~ Deposition Rate (D.R.) →

Plate 1 → $D.R._1 = \frac{1137 - 1096.5}{106}$

$= 1.37$ kg/hr

Plate 2 → $D.R_2 = \frac{1144 - 1076}{110}$

$= 2.22$ kg/hr

Relative Increase in Deposition Rate

$$= \frac{2.22 - 1.37}{1.37} \times 100$$

$$= 62\%$$

5. Result :-

(i) In dual consumable, the rate at which electrodes consume are 46% more that in single consumable case.

(ii) In terms of metal deposition rate, dual consumable welding is 62% more effective than single consumable welding.