A Critical Review on Fume Extraction System for Pipe and Plate Welding

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Abstract. In general, for both pipe and plate welding fixtures plays a crucial role. The current study investigates exposure among welders employed in the shop floor area. This welding fumes extractor has an exhaust ventilation setup to track sensitivity to welding fumes using glass fiber filter paper. The trick to acquiring the most effective system fitted to the closed atmosphere so that the gases do not disperse beyond the welding chamber is by learning the fundamentals of ventilation and airborne contaminant extraction. In previous tests, fixtures outside the fumigation hood were installed for both pipe and platform welding. By using a lathe chuck with 4 jaws fixed at both ends that keep the pipe up to 30 mm in diameter, a basic concept of the fixture is constructed. A horizontal rotating stand that is movable only in the y-axis can be set according to the area to be welded without any deflections. This device will be rotated with minimum speed, where the welding can be done effectively without press and dislocations. The main vision is to control the welding fumes in a closed chamber and to fabricate a lightweight fume extraction hood with pipe and plate welding fixtures. This research comes up with good social benefits to reduce blowout of fumes in industries and visibility during welding.

Keywords: Fume extraction systems, Fixtures, Pipe welding and Plate welding

1. INTRODUCTION
Welding is traditionally a manufacturing process that joins materials by heating and joining. According to the type of metal and strength, different types of welding are used. A fixture is used for pipe and plate welding by holding the work piece in a horizontal and vertical position. A chromatography paper is also called a filter paper, which is a semi-permeable paper barrier inserted onto fluid or airflow. It is used to extract fine solids from liquids and gases. Filters are made of cardboard or sturdy paper giving the base of your joint some much-needed stability. A fume extraction system is one that utilizes a fan using a negative draft to pull fumes and dust particles into a contained filtration system. The automobile industry in particular uses GMAW welding almost exclusively. In comparison to welding methods, a protective gas, such as safe arc welding is not employed. Outdoors or other air volatility zones are rarely used. Instead a hollow
electrode wiring that is packed with the flow on the inside, also doesn't use any shielding gas in a similar phase.

In semiautomatic and automatic modes, the GMAW mechanism can be controlled. The selecting of suitable blanks, electrodes and welding requires in all locations can result in all commercially applied metals and alloys. The schematic diagram of GMAW is depicted in Figure 1.

This process removes hazardous particles from the air long exposure to welding smoke can destroy the lung and cause numerous cancers, including pulmonary, larynx and urinary tract. Relevant fumes may have a health impact involving metal fumes, stomach ulcers, kidney injury and damage to the nervous system. So the welding process eventually introduces welders to the pollutant of smoke and steam.

Table 1. Hazards of welding fumes and gases

| Fumes             | Effects                                                                 |
|-------------------|-------------------------------------------------------------------------|
| Molybdenum        | Eye, nose and throat pain and difficulty breathing are acute symptoms. |
| Nickel            | Acute effect is skin, nose and throat discomfort. Increased cancer risk was observed in non-welding professions. And also connected to dermatitis and respiratory disorders |
| Copper            | Acute symptoms involve eye, nose, throat and nausea                     |
| Aluminium         | Respiratory irritant.                                                   |
| Beryllium         | Chronic effects includes respiratory damage.                            |
| Cadmium oxide     | Respiratory discomfort, painful and dry throat, chest pressure, breathing difficulties. Includes renal failure and emphysema. |
| Chromium          | Increased lung cancer risk. Some people can experience skin irritation. Some are carcinogens. |
The above Table 1. Shows the hazards of Welding Fumes and Gases for various metal fumes, sources and its effect on human body.

2. FUME EXTRACTION SYSTEMS USED IN WELDING

2.1. Design of Fume Extraction Systems
Welder's sensitivity to soldering fumes can trigger injuries to the workforce. The present study aims to examine exposure to air pollutants among welders employed in a complex repair shop and to establish a proper ventilation system for tracking exposures to fumes generated during welding. At the end of the evaluation, after the ventilation device had been mounted, the susceptibility of the welders to soldering gases was tested again [49]. Based on the data collected, before deploying the ventilation setup, sales technicians were exposed to metal fumes.

While a technical construction team that comprises both a mechanical engineer and an industrial hygienist should still construction ventilation and extraction systems for conservation laboratories, a good knowledge of general ventilation standards and exhaust methods provides the conservator with the necessary knowledge to ask the right questions and provides the required details to provide the best configuration for the conservator [38].

Fume hoods are extensively used to prevent toxic contaminants from charging ports, tapping holes and other minerals or smelting vessel gaps [43]. However the integration of the traditional approach with computational fluid dynamics (CFD) approaches would provide a good vision of current system constraints, and improved hood architecture can be accomplished. This analysis concentrates on evaluation by integrating a fume extraction method for a zinc sludge load terminal. This same analysis indicates the real factory components (stick and fan) were unable to catch the necessary volume of fume and were faulty in their original construction.

2.2. Extraction Hood with Filter
Arc welding has produced dynamic aerosols consisting of potentially dangerous fumes and gases [50]. The incidence, length and duration among welders of upper and lower airway infections has been increased. Studies have taken place. This study aimed at exploring the impact of pulmonary exposure to welding gases in human and animal studies on local or systemic oxidative stress.

The welding of fumes from stainless steel are actually dangerous to health[33]. This study is intended to determine the manganese (Mn) and chromium (Cr) natural selection of welding fume particles. The particles were described using microscopic, spectroscopic, and electroanalytical techniques. When subjected to PBS, Cr was mainly derived from welding fume fragments, followed by Mn, nickel, and iron.

In higher education institutions, this study is intended to evaluate the successful air removal approach and secure safety during the welding phase for the welding bay. This research continues with a visit to organisations with an air mining facility to further study this facility[6].

2.3. Filter Papers used in Welding
During the welding process, the fume extraction setup typically eliminates fumes from workstations [41]. The key purpose of the work is to remove, filtrate, and then discharge the gases emitted during the welding operation into the environment, thus reducing the impact of the gases on both staff and the environment. In the lower face of the setup, a fan is used to take out the gases. This will protect the welders and the atmosphere from toxic gases.

Table 2. Types of Filter papers
Various filter papers used for extensive applications are given in Table 2.

The fumes and metallic gases are released from the work piece during the welding phase, causing irritation to a worker where gases have been inhaled or consumed [37]. This can lead to respiratory issues including lung function changes, bronchitis, and cancer of the lung. The present work focuses on the architecture of the fume extraction system and also checks the effects during the welding process such as system efficiency, filtration and eco-friendliness.

The materials used for fumes extractor design and manufacture have been chosen based on cost, protection, functionality, ease of use and inexpensive maintenance. The manufactured fume extractor was tested at several soldering sites and was highly successful in the elimination of gases from the respiratory region of the welder. It was also observed that the function of the extractor did not adversely affect the welding process [36].

This research is intended to create a device that removes welding gases from the welding area and keeps other workers in the area protected [35]. The, hood size, location of hood, size of duct, and size of were designed, picked, and developed according to ASHRAE standards. This finding indicate that welding from the hood eliminates 0 mm to 100 mm of smoke from the source while in There was a significant lag in the smoke extraction gap between 200 mm to 400 mm from the roof, but smoke reached the welder's breathing zone at 500 mm.

| Sl.No. | Name of the Filter                  | Applications                                                                 |
|--------|------------------------------------|-----------------------------------------------------------------------------|
| 1      | Cellulose filters                  | It is used for generic filtration and particle retention up to 2.5 μm       |
| 2      | Glass and quartz filters           | Used for filtration process.                                                |
| 3      | Circular Membranes                | It is available in different pore sizes and in gridded forms for several application |
| 4      | Speciality cellulose papers       | It is used for seedling growth testing, chromatography refilling, and other applications |
The exhaust and metal gasses are transferred from the operational part to a specialist who turns the emissions and danger of gasses into or absorbing it. This may contribute to signs of respiration, such as better pulmonary function, bronchitis and lung growth [39]. A significant protection and modern guidance for cleanliness is to track hazards by previously upgrading individual defence gear by creating and controlling controls. When gases are inhaled or swallowed, the exhaust and metallic gases are transferred from the job item, making the pollution and threat a professional. This will have pulmonary implications, including lung activity shifts, bronchitis and conceivable development of the lungs. The study currently in progress governs the design and manufacture of carbon-free smoke systems and also controls how welding work is carried out, e.g. frame productivity and filter cap.

The key parameters influencing the efficiency of fume recovery are examined in this study, namely the extract flow rate, location of the torch suction openings, angle of the torch to the work piece for welding, mode of metal movement, and percentage of welding deposition. The theoretical motion caused by suction, determined from the extract flow rate and suction opening direction, is the key parameter influencing the performance of the device. The direction of the torch relative to the work piece is therefore subject to a great deal of regulation. In designing advanced torch extraction mechanisms, the study results may be used to provide information to establish unit goals [3].

A technical approach has been established that allows for evaluating the rate of fume forming and composition in arc welding processes [16]. This procedure has been used to discern particulate emissions in a variety of processes like gas metal arc (GMA), flux-core arc (FCA), shielded metal arc (SMA)and gas tungsten arc (GTA) welding, allowing these processes to be categorised according to their relative "cleanliness." Based on the findings, suggested fume control approaches that could supplement ventilation.

Membrane filters have come into general usage in recent years for the filtration of previous analysis of liquid samples [17]. Materials are film filters in different size sizes that separate the water from suspended products. Filtration is widely recognized as a way of obtaining acceptable samples and filtration has been a first phase in processing water samples for trace metal examination.

Welding fume contains components that, if inhaled or swallowed, can be harmful to the health of employees in their basic forms. Therefore, when considering fume toxicity, the chemical structure of the welding fume needs to be investigated. Various methods of chemical processing are described and their applicability to airborne particles is explained[20]. Particle size data is important as a given characterization technique produces only accurate data for a certain size range. This article uses a variety of characterizations for comparison and illustration purposes to research the chemistry of mild steel welding emissions. Ray X (XRD) defractions suggest that the smoke from mild steel gas arc (GMAW) is mainly magnetite, while a mixed alkaline fluoride (SMAW) and a spinal oxide portion of a Fe-Mn are the smoke of a mild steel shielded metal arc welding. (SMAW).

2.4. Venting of Welding Fumes from Hood

Gas metal arc welding emissions were produced from steel plate and weighed near the arc, reflecting the welder's first-hand exposure, and farther away from the source. After the welding process was interrupted, samples are taken at one minute welding runs and subsequent five minute intervals. The distribution of number sizes was calculated in real time[4]. The mean mass values were 45 mg/m³ and 9 mg/m³ estimated near the arc. The difference in both distances of concentrations was attributed to spread particles present in morphological samples only close to the source.

Extraction system mainly consists of fume hood, blower and electric motor [48]. The engine is located in both systems at a foot-mount position in a rectangular iron structure and is compactly fitted with a blower attached by a flexible shaft pipe to the fume hood. The lightweight machine has a minimal weight and a fume hood like a cone. In terms of the weight, height, Speed, voltage determining, shape and scale, and the engine enclosure, the portable unit varies from the compact model.
3. **FIXTURE FOR PLATE WELDING**

To address the problems associated with the reconstruction of thin surfaces, a fundamental mechanical fixture is proposed. The mounting is the same as a lever-like clamp and the fine sheets are accurately and evenly held along the welding line unlike other traditional FSW mountings. Asbestos was used as a cover plate to reduce heat loss [15]. With 0.5mm fine, aluminium Alloy 6061-T6 sheets welded successfully at five separate rates, the feasibility of the fixture was verified.

This review would examine the impact of welding systems on the delivery and residual stress values during GTAW. The GTAW assembly of AA5251 is being tested by ABAQUS, a transient thermal mechanical study conducted using methods for finite elements [25]. Moreover the distributions and transverse and longitudinal residual stresses are adjusted effectively when applying a welding fixture.

A variable grid mesh was used to ensure precise measurement of the welded pool layout, mushy zone size and temperature distribution near thermal sources, a computer model was developed using the finite difference method and the enthalpy model to explain the continuous state of the two-dimensional heat flow during welding of fine plates. The experimental findings from 6061 aluminium were correlated with the measured model heat flow results, including the fusion zone width and the thermal cycles in both fusion and heat zones [26].

This analysis centred on the study of the impact of tooling geometry on material movement when the 1mm AA 5182-H111 and AA 6016-T4 aluminium sheet are welded heterogeneously [28]. The conical cavity shoulder and the scrolling shoulder are used with two types of instrument shoulder.

Thin plates are commonly employed in aerospace, marine and industrial industries to minimise parts weight. In addition to the temperature-dependent heat physical and mechanical characteristics, the weld reinforcement form was also taken into account in the finite element model [7]. Meanwhile, numerical results have been validated by experiments. For perforated welding, an arc welding robot was used for tests.

Two thin elastic plates are bound by a traveling general heat supply in the form of infinite half-plane, which moves at constant speed with a butt weld. The tension on the welding direction and the distortion of the open end arising from the welding process was analyzed by using the Mellin-transformation technique [5].

Laser Welding (LW) is increasingly chosen as a manufacturing method because of its advantages, namely the ability to connect components of small dimensions, possibilities for special material joining, less heat affected region, good repeatability, high speed, etc. This article outlines various advances in three main methods, classical LW, LHW and remote laser welding [19].

During the whole process of welding for research on welding-induced buckling, thermal plastic FE analyses are given. Longitudinal compressive thermal stress is generated in the welding line relative to carbon steel due to high yield stress. Longitudinal compressive residual stress, meanwhile, exists just outside of welding [42].

The monitoring of the distribution of temperature, longitudinal and cross-sectional residual stresses and distortion in the relationship between AA5052 and AA6061 is done in this case [2]. The tests on gas metal arc welding are performed. Boundary conditions used in this research is shown in Figure.2.
The outcomes are checked using finite element analysis software ANSYS toward numerical simulations. A three-dimensional thermo-mechanical finite-element model was used to measure transient temperature, residual stress and distortions. These findings suggest that the experimentation and numerical results are in high compliance with the AA6061 pad, with higher residual longitudinal and cross stress and lower shrinkage compared to AA5052.

Thin aluminium plates are welded to the top of the alloy, their minimal corrosion tolerance may be increased. In this study, the pressure-transmitting medium comprising a longer stacking stage of Mg 96Zn 2Y2 alloy, ordered in the alpha-Mg matrix and commercial AZ31, was explosively welded to a thin alloy plate by detonating a gelatinic layer of the exploded agent. By the use of optical microscopy, electron microscopy[18], radiology and electron sample microscopy, bonding interfaces are established.

4. FIXTURE FOR PIPE WELDING
One of the most promising methods for the detection of polyethylene pipe welding defects in infrared technology can be implemented in the non-destructive region. In this work, a company's infrared video sequences were obtained from the pipeline welding phase cooling stage[24]. This suggested method could discriminate against errors by selecting the best clustering algorithm by inserting adequate coefficients, far better than destructive approaches.

To ensure the weld joint penetration, highly qualified pipe welders also have to be used to manually weld pipes. A new technique to evaluate the weld joint penetration from arc voltage measurements is suggested in this research. This approach depends on an observation made during the GTAW penetration phase of the complex growth of the sold pool surface [32]. The sold pool surface begins to extend first against the electrode and to be drawn away from the electrode until maximum penetration has been reached.

Sweat plasma arc mode (PAW) creates small internal diameter beads using large pervasive plasma jets but causes irregularity of the beads and excessive wetting angles, as well as spreading. For melting mode, plasma jets are less penetrating and higher heat inputs are sufficient to achieve the penetration. Wider sold beads are produced as a result, as does the gas tungst en arc welding (GTAW) [31]. The pattern geometry and regularity are greatly strengthened relative to the keyhole PAW with a marginally improved net heat supply. Compared with the PAW and GTAW, net heat input decreased by 40%, which lowered the ID welding gap by 40 percent.

This research aims to improve quality management decision support processes for industrial pipe welding from industrial and management level by introducing a quantity based analytical approach that enables real-time data and measurement to modify simulation models. This approach implements a Bayesian mathematical part non-confirming calculation to re-calibrate and refresh models of real-time data.
from the actual quality management systems [23].

The whole finding implies an automated, data-driven approach using an algorithm-dependent fractional fraction non-compliant estimation based on Metropolis-Hastings and an A/B test algorithm to calculate and compare the quality of operator piping for industrial construction projects [21]. Uncertainty in the use of the advanced Metropolis- Hastings algorithm can be calculated as operator weld outputs as Bayesian posterior distributors.

The desalination device would include a large quantity of stainless steel tubing. If the tubes were welded manually, there would be a lot of physical labor accompanied by very poor efficiency and the welding quality could not be ensured either. The best choice for finishing the job is also to use a robotic welding system. A robotic platform to be used for the welding of sea water desalination pipes is introduced in this article. There are four rotating axes on the robotic system and it can be mounted on a branch pipe such that it can both rotate between the pipes and adapt to the diameter of a wide range of pipes [47].

A three-dimensional numerical thermoelastic-plastic model for welding residual stress distribution was developed with MSC-Marc software for the welding of the single-pass pipe. The dynamics of tension changes are clarified by a numbered statistical approach during the pipe soldering process [44]. The measurement findings indicate that, owing to the distortion of plastic strain distribution, the axial and hoop-compressive plastic pressure on the inner tubes is far higher than on the external surface.

The worker plays a risky role in this process, such as increasing a pipe weight of 90 kg, raising the sample and welding the pipe with the sample, welding samples on a wide pipe that creates numerous problems for the body, and lowering the attached pipe is the final stage. The aim of this study is to use ergonomics principles to build workstations to help reduce physical workers concerns [1]. The findings revealed that a tool in the form of a bench, a platform for pipes and a pulley used in a new welding workstation is required for welding. Poor working place may be fixed with a new workstation. The productivity of the existing working arrangements for a modern workstation is 8.33 minutes.

Mechanical studies of butt welding technology for Polyethylene pipe joining are provided in this report. The pipe had a specific double wall arrangement, and the topology of its segment was not smooth. For material characterizations, thermodynamic studies including thermometric analysis and differential calorimetry scanning were carried out [29]. The process temperature and time were dependent on the test results to ensure that the pipes were sealed by means of a hot-plate system. Through temperature control, the welding process was closely monitored.

A modern welding process based on a quick magnet pulse forming and a solid-phase diffusion welding device is a particular advantage in welding heterologous pipe fittings. The impact intensity of the Al-Fe welding tubes is studied utilising high stress rate components 3A21Al alloy relationships to combine computational simulations and technical analysis [45]. The energy spectrum evaluation has shown that pipes are deformed at high speed and the elevated temperatures improves the action of atoms among other products, creating a mass flux from the surface under heavy impacts and granulate substances.

Numerical simulation technologies used during computer hardware and software engineering to model welding temperature fields, residual strain, and distortion. However the impacts of initial stresses created by the production phase before welding on residual stresses caused by welding have to be studied experimentally and numerically [10].

A computer device based on thermal elastic FEM plastic has been developed in current research to explain the impact of the initial stress on the solder-induced waste heat treatment in austenitic stainless steel tubing. In order to develop initial stresses in the pipe prior to welding, a heat treatment procedure which is identical to a heating solution is used. The change in brittle fracture properties is studied in a pipe created because of the existence of welding residual stresses (RS) [34]. Welding RS is simulated and experimentally tested by the use of a 3D FE model. At the weld line, an inner circumferential thumbnail crack is added. Pipe geometry along with a rotating table is shown in Figure 3.
The revised Baramin model were used as a method for calculating hardness distribution in the event of RS welding. With experimentation with low and high restriction samples, the model is calibrated at 150 ºC.

The most critical method for the efficient execution of industrial building projects is the production of pipe rolls. Because with the different combinations of tubing attributes in terms of named tube size (NPS), tubes schedule and content, the performance of tube welding efficiency based on the historic available data is difficult for practitioners to estimate[22]. In this suggested approach the method of welding pipe is modelled first as a Bernoulli technique.

The ANSYS software utilizes an axisymmetric representation of a two-dimensional finite element [40]. Since the objectives of this research can be used to describe the distribution of the residual stresses of a thick wall tube sold prior to or after PWHT. The advanced lumped-pass calculation is therefore a promising and useful method of calculating residual stress from an engineering viewpoint in large and complicated welded structures.

The property of the weldment with stress distribution in a stainless steel pipe of the SUS304 was numerically examined with an inert gas arc welding torch. Furthermore the residual stresses expected by the current theoretical approach are contrasted with the measured data; and the comparison reveals that the position of welding residual stress distribution near the start/end area was effectively captured by numerical simulation phase[9]. The outcomes of a computer simulation reveal that at the beginning and end of the weld both the hoops and the axial residual stresses have sharp gradients and are substantially different from those in constant range.

Friction stir welding (FSW) is a compelling, effective technique confined by its range of operation and processing. This expands the spectrum of applications to small-diameter butted pipe sections and improves performance quality at high rates of production. This thesis explores these issues with experimental and analytical methods. It shows an FSW process method which produces suitable pipe joints.[27].

This research focuses on the laser welding of high-power fibre steel material for the manufacture of tubing. A combined laser power of 8 kW laser GMA hybrid was welded with steel plates of the X65 and X70 material of 9.5mm and 14mm thicknesses. Two independent filler wires and joint preparations have been tested for their weldability [14]. The checking of samples were carried out such as hardness, traction testing and Charpy V-notch measurements were done and the findings were described in this study in conjunction with these welding processes and thicknesses.

With volumetric modification of the yield stress caused by phase transformation, the FE model integrated the solid-state transformation into the welding process. Temperature-based physical and mechanical properties as well as the plasticity of the phase transition were regarded in the FE model. The solutions demonstrated the value of considering solid-state phase transfer in pipe welding simulation [30].

For the secure running of power plants, the integrity and resilience of sold pipes are important and can be damaged due to residual stress. The finite element (FE) approach is an efficient way to estimate residual stress in these components as long as material activity can be precisely modelled. This study states that FE simulates residual stress, primarily by using nickel-based alloy (IN625) as a separate soldering material due
to P92 steel pipe welding arc[46]. The structural parts evaluate the FE process and the effects are described and discussed in order to assess the stress region in the welded pipe.

In the manufacture of large diameter submerged-arc welding tubing, crimping is used. In some welding pipe development modes, several studies concentrate on crimping[12]. ABAQUS Finite Element programme creates a two-dimensional finite element model in order to explore the effect of technological parameters on generating consistency. Comparable tests confirm that the Finite Element model is less than 5% structure failure, demonstrating that its geometric precision meets the criterion. Characteristics such as stress distribution and stress distribution and adjustments in shaping capacity are acquired and simulation analysis offers connection curves of technological parameters for performance growth. The sensitivity analysis shows that the effects of the crimping duration and the technical parameters of the punch on the consistency of the forming process are important. In particular, the Response Surface Method (RSM) regresses data from simulation analysis to determine the prediction model. From the prediction model, the feasible technological parameters are obtained.

In the proposed work, both computer simulation and experimental approaches have been used to investigate the distribution of residual stress welding in a dissimilar medium-diameter metal pipe joint carried by a multi-pass welding technology [8]. The next move was to create an experimental mock-up to calculate rest stress distributions on the surfaces inside and outside. By comparing the results of simulations and tests measurements, we will deduce that in order to reliably predict residual stresses in the entire range of the various metal tubing, other main production methods, such as coverage, buttering and thermal therapy, also should be regarded in addition to the multipass welding method.

To investigate the impact of the soldering series on welding residual stress distribution of a thin-walled 6061 aluminium alloy framework, a three-dimensional finite-element method based on ABAQUS code was developed. The thermo-mechanical activity has been simulated using a direct-connected formulation to obtain sound numerical results [13]. In nine different simulation sequences, the single-pass TIG welding of an octagonal pipe joint and the allocation of longitudinal and transverse residual stress were evaluated on the pipe's external and inner surfaces.

The intent of this research is to examine the effects of high-density polyethylene (HDPE) samples on fracture strength by strain rate, specimen thickness and weld. The welds at the tubing junction are made by the butt-fusion (BF) welding. Tensile test specimens are longitudinal cut from the 30 mm thick pipe and weighed at different crosshead and gauge widths, in order to assess the mechanical characteristics of welded and non-welded specimens. The three-point bent (CTPB) fracture specimens are included. At room temperature and at differing crosshead rates, the effect of specimen thickness differences on welded and non-welded specimens is studied. The analytical findings also revealed the important influence on the fracture durability of the crosshead speed of both welded and non-welded specimens [11].

5. CONCLUSIONS

Most of the research was carried out for an economic fume extraction system extensively used for welding. So a cost effective fume extraction hood has to be fabricated for effective measurement of fume formation rates during welding. In automated and semi-automatic modes, the GMAW mechanism can be controlled. By choosing the correct shielding gas, electrode, and welding specifications for all commercially relevant products, fumes can be collected effectively. The shielding gas used in a welding process greatly affects the overall welding process efficiency. The shielding gas connects to create essential strength, toughness, with the base material and, if necessary, with the filler material.

Welding fixtures for both plate and pipe welding plays a crucial part in effective utilization of fume extraction systems. This critical review will provide a clear understanding of fume extraction system design and welding fixture for both plate and pipe welding. Based upon the filter paper, fume extraction system can be easily fabricated to prevent welders health from atmosphere and also from the contaminants.
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